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Mining
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THE

MINING AND SMELTING MAGAZINE:

A MONTHLY REVIEW OF

MINING, QUARRYING, AND METALLURGY

WITH THEIR

ASSOCIATED ARTS AND SCIENCES,

AND

Record of the Mining and Metal Markets.

EDITED BY

HENRY CURWEN SALMON, F.G.S., F.C.S.

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602

VOL. VI.

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THE

MINING AND SMELTING MAGAZINE.

JULY, 1864.

The Metallurgical Processes of the Mansfeld Copper Works.

By Albrecht von Groddeck, Metallurgical Engineer, of Stolberg, near Aix-la-Chapelle.*

I. General Conditions.

The general conditions under which the Mansfeld processes are carried on may be considered under the three following heads:—

§ 1. Raw materials, comprising materials used in smelting (ores, fluxes, and fuel), and materials used for building purposes;
§ 2. Motive power and labour; and
§ 3. Capital.

§ 1. *Raw Materials.*

a. Ores:

Mode of Occurrence.—The copper-schist, which is a constant member of that portion of the Zechstein formation which spreads itself in narrow zones over the highly inclined edges of the older rocks of the Harz, of the Rhenish Slate Mountains, and of the Thüringer Wald, is deposited in a large basin, overlain by Triassic rocks, lying between these mountain ranges. As early as 920, as is shown by old records, it was mined at Frankenberg in Hesse, thus originating the earliest German mining. Further east, where the flourishing Mansfeld mines are situated, this schist formation was discovered in 1199, at Kupferberge, near Hettstädt, and has been worked ever since. It has here the character of a bituminous marl, largely impregnated with various metallic minerals, overlying a white sandstone called the *Weissliegenden*, which is in fact the

* Abstracted from the *Berg- und Hütten. Zeit.*, Nos. 8, 11, 17, 23, &c., 1864.

uppermost member of the *Rothliegenden*, and being overlain by the Zechstein.

Economic Value.—This impregnation of the schist with copper, silver, and other metals, forms a distinctive characteristic, which does not seem to be met with, at least to anything like the same extent, in any other European country, or indeed in any other part of the world, as far as known. But although the copper-schist is always characterised by this metalliferous impregnation, the latter is not always found sufficiently concentrated to be profitably mined, even if the conditions were, in other respects, favourable to its working and metallurgical treatment. Thus, all attempts, ancient and modern, have failed in mining this copper-schist on the north, west, or south outcrop of the basin, as at Stolberg in the Harz, Eisenach, &c., or in the centre, at Kyffhäuser, where it has been brought to the surface by elevatory forces. Indeed, it is only at a few points, where it crops out for a length of some miles, that it can be profitably worked, as at Mansfeld, Riechelsdorf in Hesse, and Kamsdorf in Thüringer.

Although at Mansfeld the metalliferous impregnation extends through the whole depth of the deposit, 18 to 20 inches, only about from 3 to 5 inches of this can generally be profitably worked. At some points, the metalliferous impregnation extends upwards into the roof (*Dach*) or downwards into the sandstones of the floor, forming the "Sand-ores" (*Sanderze*); in both of which cases the produce becomes comparatively so increased that the whole of the bed becomes worth working. In determining the extent of the schist, *Sand-ores*, and *Dach* workable, it is necessary to take into consideration the several local conditions. Under present commercial and technical conditions at Mansfeld, work yielding on an average $1\frac{1}{2}$ centners of copper to the *Fuder* of 60 centners, or 2·5% of copper (which copper contains $\frac{1}{2}$ lb. of silver to the centner, equal to 0·012% of silver in the work), can be treated with considerable profit.

Conditions of Deposit and Working.—The copper-schist deposit of the Mansfeld district forms a flat trough, with an average dip of from 5° to 6°, overlain by the Bunter sandstone, between the Coal-measure formation near Halle and the Silurian rocks of the Eastern Harz. This trough, which is open to the south where it is connected with the Thüringer basin, has always been the principal seat of the copper-schist mining; a fact due to the slightly inclined, and on the whole but little disturbed, position of the strata. From Hettstädt, where the conditions were most favourable for mining, and where consequently it had its beginning in 1199, workings spread both north and south, in consequence of the almost horizontal extension of the strata in those directions—connecting them with the Magdeburg basin immediately adjoining on the north. Unfavourable circumstances retarded mining in the Magdeburg basin until the commencement of the present century; while in the Mansfeld basin, an adit level was the means of insuring an uninterrupted working. Mining on the skirts of the Thüringer basin has never been of any importance: that at Stolberg was abandoned a short time ago, and it is doubtful whether that at Sangerhäuser can be continued in depth.

Notwithstanding that the experience of many years in the Mansfeld basin has shown that, on an average, a square *lachter* (sq. fathom) of ground must be broken to get half a centner (55 lbs.) of copper, with its corresponding proportion of silver, yet at the present time operations are only being carried on at an inconsiderable depth below the outcrop of the deposit. The great length of this outcrop, which is readily traceable by the large barren waste heaps, as well as its very trifling dip, explains this circumstance. The principle workings are above the adit level, about 85 *lachter* (fathoms) under the surface, where there is such a quantity of whole ground yet standing that it will not be necessary to sink to a deeper level for some time. As the mouth of the adit level is only 1 *lachter* above the mean height of the Saale, and is consequently the lowest level of natural drainage attainable, it will facilitate any future deep workings. Where the workings have been carried under the level of this deep adit, as at the 5th working level of the Schaafbreiter concession (24 *lachters* under the adit), and at other points, the dip of the bed has been found to remain the same; and if this should be found to be the case in depth, or if, as seems probable, the dip should decrease, the supply of copper-schist cannot fail for an immeasurable time to come, as the trough has an area of 4 square German miles (16 sq. miles, English), and is, at its deepest point, only from 280 to 300 *lachters* from surface.

Mining Concessions.—The mining operations of the Mansfeld basin may be divided into two groups of concessions—one between Friedeburg and Gross-Œrner, includes the "lower concessions," and the other, between Mansfeld and Eisleben, the "upper concessions." The "lower concessions" comprise—Concession No. 32, Concession No. 31, the Burgörner Concession, and the Stockbacher Concession. The "upper concessions" comprise—Hirschwinkler, Kuxberger, Ahlsdorfer, Holzberger, Glückaufer, and Schaafbreiter. Besides these, mining operations are also carried on on the southern edge of the Harz, near Sangerhausen, in the "Sangerhäuser Concessions," the produce from which is at present treated with that of the Mansfeld basin. The produce of these three concession-groups shows considerable variation, as will be seen from what follows.

Work.—In Mansfeld all smeltable ores, whether copper-schist, sand-ores (*sanderze*), or *dach*, are classed under the general name of *Minern* (*work*).

1. *Copper Schist.*—The metallic minerals of various kinds (for the most part sulphides) distributed through this copper-schist, are generally more or less finely disseminated. Frequently, and particularly in the richer schists, they are so finely distributed that they can often only be recognised by the different appearance of the fracture. Where several ores occur together, and are very finely distributed, it becomes even impossible to recognise them with a glass. The copper-schist contains the following economically valuable metals: copper, principally as vitreous copper (Redruthite), purple copper (Bornite) and copper pyrites (Towanite); and silver and nickel, not usually recognisable in distinct minerals. These metals are variously distributed in different parts of the copper-schist, and upon this depends its workable value. With a little

practice, it is not found difficult to judge, by the outward appearance of the schist, as to its metallic contents. A deep black colour—a violet blue (variegated copper), a golden yellow (copper pyrites), or a dark grey lustre on fracture—and very thin laminæ, indicate a rich schist. Bright colours (or a very deep black arising from an excess of carbonaceous matter)—numerous fine white or grey streaks of gypsum (*weissharig*)—a dull or a yellowish grey lustre on fracture (sulphur pyrites)—and thick laminæ, indicate a poor schist. If the lustre is entirely absent, and distinct particles of ore, whether in grains or nodules, are visible, the schist is not considered worth treating; it is most valuable when it contains a preponderance of copper pyrites. There are no exterior indications by which the relative proportions of copper and silver can be judged of; indeed these metals have no definite relations to each other.

The following results of some assays will give an idea of the absolute and relative proportions of copper and silver contained in the schists from the various concessions:—

In 1 *Fuder* (of 60 centners = about 3 tons English) of schist there are—

		Per cent.			Per cent.	
At Schaafbreiter ..	169 Pfd.	(=2·8)	of Cu, which Cu contains		0·577	of Ag.*
„ Kuxberger ..	184 „	(=3·06)	„	„	0·514	„
„ Glückaufer ..	168 „	(=2·8)	„	„	0·438	„
„ Hirschwinkler ..	143 „	(=2·38)	„	„	0·481	„
„ Burgörner ..	133 „	(=2·21)	„	„	0·420	„
„ Concession No. 31..	154 „	(=2·56)	„	„	0·547	„
„ „ No. 32..	98 „	(=1·63)	„	„	0·520	„
„ Sangerhaüser ..	192 „	(=3·2)	„	„	0·308	„

From these results it will be seen that the schists of the "lower concessions" are poorer than those of the "upper concessions." The latter also are distinguished from the former by being harder, and more refractory in smelting.

The proportion of nickel in the schist is inconsiderable, but after the latter has gone through the various metallurgical processes, the nickel is found concentrated in certain residues (*Krätzkupfer* No. 3) to the extent of about 20%, and consequently becomes worthy of economical consideration. Among the metals, earths, and metalloids which do not pass into the smelted product but slag off, the schist contains large quantities of iron, zinc, lead, cobalt, arsenic, and antimony, alumina (about 10·7%), lime (about 19·5%), magnesia (about 6·5%), potash (about 2%), silica (about 40%) and sulphur. A comparatively small proportion of iron, antimony, and arsenic, with a proportionately high proportion of silicic acid, distinguishes the Mansfeld ore from that of the Upper and Lower Harz, and is the chief cause of the differences in their mode of treatment.

2. *Sand-ores* (*Sanderze*).—The metalliferous, calcareous and bituminous constituents of the copper-schist bed have, in some localities, particularly in the Sangerhäuser and Upper Mansfeld

* The percentage of Ag in the *work* may be found by multiplying the percentage of Cu in the work by the percentage of Ag in the Cu, and dividing by 100: thus 2·8 × ·577 = 1·6156 ÷ 100 = ·016, the percentage of Ag in the *work*. —Ed. M. & S. M.

Concessions, been found to extend downwards into the floor, forming the "Sand-ores." These are composed of white sandstone from one-half to three-quarters of a fathom thick, and are impregnated with the same ores as the copper-schist (vitreous copper, purple copper, copper pyrites, &c.) which occur partly in small nests or nodules, and partly in thin laminæ. The percentage of copper yielded by these sand-ores varies very widely; the poor sand-ores, not worth being directly smelted, containing only about 120 Pfd. to 150 Pfd. of copper per *Fuder* (= 2·2 to 2·5% of Cu) while the rich sand-ores range from 324 Pfd. to 517 Pfd. per *Fuder* (=5·4 to 8·6% of Cu). Their earthy and other accessory matters are similar to those of the copper schists, except that they are naturally much richer in silica, which accounts for their being so difficult to smelt.

3. *Dach.* The roof of the copper-schist bed, a compact grey limestone, locally called *Dach* (from 10 to 15 inches thick), is also frequently so impregnated by copper ores as to be worth smelting. The ore is for the most part in the form of vitreous copper, diffused in small nodules up to the size of about a hazel-nut, with small quantities of sulphur pyrites. In the Sangerhäuser Concession 1 *Fuder* of *Dach* yields from 61 to 105 Pfd. of copper (= 1·04 to 1·75% of Cu) and the centner of copper ·178 to ·256% of silver.

Besides the ores named, the following minerals occur more or less frequently: native copper, red copper ore, blue carbonate of copper, Galena, copper-nickel (Nickaline), Malachite, blue copper (Covelline), native silver, tin-white cobalt (Smaltine), Baryte, Arragonite, &c., &c. There are also many other constituents which only show themselves in the smelted product, such as manganese, molybdenum, vanadium, selenium, &c., &c.

Ores of *Nickel* (copper-nickel, Nickelline) occur in small veins penetrating the schist-bed and the neighbouring strata, particularly in the Sangerhäuser Concession, and at one point are sufficiently abundant to be metallurgically treated.

b. FLUXES:

Fluorspar.—Fluorspar is generally used for smelting work rich in Silica. It is partly obtained from the fluorspar mines of the Mansfeld district, near Rottleberode, and partly brought from the Strassberger mines; it is very expensive, costing 8 sgr. per centner (9*d.* per cwt.) at the Sangerhäuser works, and 15 sgr (about 1*s.* 6*d.* per cwt.) at the Friedeburger works.

Concentration-slag has recently been used mixed with fluorspar as a flux; it contains about 34% of Si, 37·68% of Fe, 0·68% of Cu, with a considerable proportion of mechanically intermixed stoney matters, and shows by assay about 8% of copper.

Quartz-sand is also used in concentrating the roasted products in reverberatory furnaces, which require, in consequence of their strong basic nature, a flux of silica. It is found in sufficient quantities in the vicinity of the works.

Poor Sand-ores have lately been advantageously used as a flux, since their metallic contents (from 120 to 150 Pfd. Cu per *Fuder* =

2 to 2½%) could not be profitable extracted by any other means. At the Sangerhäuser works the sand-ores are washed, and stamped by a 6-heads stamps.

Clay, which is found in the Mansfeld basin in large quantities and of good quality, is used in smelting black-copper for kneading-up the desilverised residues.

Sulphur Pyrites is used in assaying the schist, and in blowing in and blowing out the black-copper furnaces.

c. FUEL:

In the Mansfeld metallurgical processes the following fuel is used: wood, young birch poles, brushwood, charcoal, coal, coke, and lignite.

Wood and Charcoal.—The wood and charcoal used are procured partly from the forests belonging to the works, and partly by purchase. From the working returns for 1862 the weight of the hard and soft charcoal used at the respective works was as follows: the *tonne* is a measure of capacity equal to about 4 bushels, English; and the *pfund* equals about $\frac{1}{10}$ more than an English lb.

	1 Tonne Hard Charcoal.	1 Tonne Soft Charcoal.
	Pfd.	Pfd.
At the Mansfelderhütte	87	63
„ Eislebenerhütte	90	70
„ Kupferkammerhütte	92	70
„ Friedeburgerhütte	92	70
„ Sangerhäuserhütte	120–130	90–100
„ Gottesbelohnungshütte	85–90	65–70

One cubic foot of hard charcoal weighs 12·6–14 Pfd.
„ soft „ 8·8–9·8 „

Coal and Coke.—Coal and coke are procured from various localities, partly by the Saale, partly by the railway to Stassfurth, partly by road. From the working returns for 1862 the weight of the coal and coke at the respective works was as follows:—

	1 Tonne English Coal.	1 Tonne Wettiner Coal.
	Pfd.	Pfd.
At the Mansfelderhütte	314	387
„ Eislebenerhütte	300	380
„ Kupferkammerhütte	300–310	320–330
„ Friedeburgerhütte	300–310	320–330
„ Sangerhäuserhütte	360–370	360–370
„ Gottesbelohnungshütte	335–345	360–365

One cubic foot of English coal weighs 42–52 Pfd.
„ Wettiner „ 45–54 „

The value of these different kinds of coke for smelting purposes may be classed in the following order: English coke, Westphalian coke, Gas coke and Wettiner coke.

	1 Tonne Coke. Pfd.
At the Mansfelderhütte	140–190
„ Eislebenerhütte	140–195
„ Kupferkammerhütte	145–195
„ Friedeburgerhütte	145–155
„ Sangerhäuserhütte	140–195
„ Gottesbelohnungshütte	150–190

One cubic foot of gas-coke weighs .. .. .. 20·3–21·7 Pfd.
„ English and Westphalian weighs .. 24·6–26·7 „

Lignite.—The Tertiary deposit overlying the Bunter sandstone of the Mansfeld and Thüringer basins contains considerable deposits of lignite. The bed near Riestädt, not far from Sangerhausen, belongs to the Mansfeld Company, and most of the lignite used in the metallurgical processes is procured from it; small quantities are purchased in other localities, as at Benndorf. From the working returns for 1862 the weight of the Riestädt lignite used at the respective works was as follows:—

	1 Tonne. Pfd.
At the Mansfelderhütte	280–300
„ Eislebenerhütte	270–350
„ Kupferkammerhütte	290–300
„ Friedeburgerhütte	290–300
„ Sangerhäuserhütte	300–350
„ Gottesbelohnungshütte	300–325

One cubic foot of this lignite weighs 37·9–49·2 Pfd.

d. Building Materials:

The Rothliegende, the Zechstein, and the Bunter sandstone furnish the very best of materials for the buildings and furnaces.

Zechstein.—The Zechstein is easily worked and is an excellent material for foundations.

White and Red Sandstone.—White and red sandstone, in blocks of any required size, is found at several points in the Rothliegende and Bunter sandstone, as at Liebigerode, Kyffhäuser, Polleben, and Besenberg. It is used for the walls of the buildings, and for the outer walls, and the walls of the hearths of the smelting furnaces.

Fire-clay.—Near Salzmünde, on the Saale, fire-clay is found, which is applied to the manufacture of fire-bricks that are extensively used in the building of the Mansfeld smelting furnaces. The better kinds of English fire-bricks also are used in the erection of the refining furnaces.

Clay for the making of *bricks* is very abundant, as is also *quartz-sand* for the hearths of the concentration and refining furnaces. *Clay* for preparing the coal-dust is also found in sufficient quantities. *Slag* as a building stone is extensively employed at the work, as at the sulphuric acid works of Kupferkammer and Eckhardt, and in the neighbourhood generally.

§ 2. *Motive Power and Labour.*

a. MOTIVE POWER:

Water-power.—The smelting works of the Mansfeld Copper-schist Mining Company are located not merely with a view of their vicinity to the copper-schist mining operations, but also to their contiguity to water-power. The selection of the site of the newest works—those of Eckardthütte near Leimbach, which were put in operation in 1860—was principally influenced by this consideration, although as much steam as water-power is here required to insure continued working. Indeed the fluctuating supply of water-power in most years has rendered a reserve steam power necessary in the case of all the older works, although the water-power available is amply sufficient under normal conditions.

This water-power is supplied—(1.) by those tributaries of the Saale which traverse the Mansfeld basin (the Wipper, Schlenze, and the Volkstädter brook); (2.) by mining levels (the Zabenstädter and Gonnaer levels); and (3) by leats (the Steinmetzgrund and Alteröder Stolln).

The most important source of the water-power used is the River Wipper, which, flowing from the Harz, traverses the northern portion of the Mansfeld basin, passing Leimbach and Hettstädt and flowing in a N.E. direction. It fortunately happens that this river traverses the copper-schist formation about the centre of the most important mining operations, where most of the smelting works are located at comparatively trifling distances from each other. Following the course of the stream we have, first, just above Leimbach, the Eckardthütte, and then the Kreutzhütte; below Leimbach, the Guttesbelohnungshütte, and the Kupferkammerhutte; and lastly, a little below Hettstädt, the Saigerhütte.

Corresponding with the extent of the mining operations, which stretch along the whole outcrop of the deposit for a length of from 4 to 4½ German miles (16 to 17 miles English), besides the works mentioned, situated in the centre of the mining operations, there are others at each end; but for these there is little water-power available. The works at the S.E. end, the Oberhütte and Mittelhütte, are supplied with water-power by the Volkstädter brook, the Steinmetzgrund and the Alteröder Stolln. The Friedeburger works, at the N.E. end, are supplied by the Schlenze river and the Zabenstädter Stolln. The Sangerhäuser works, which are isolated, are supplied with water-power principally by the Gonnaer Stolln, and in wet years by brooks flowing from the Harz.

The water-power most essential in the smelting of the raw ore, and the power available at the works where this operation is carried out, is as follows:—

At the	Eckardthütte	8 H.P.
„	Kreutzhütte	11½ „
„	Kupferkammerhütte	7 „
„	Friedeburgerhütte	2½ „
„	Sangerhäuserhütte	2 „
„	Eislebenerhütte	2 „
	Total	33 „

The figures are rather under than over the mark, the minimum power available having been taken in each case. In 1862 24,804 *Fuder* of schist was smelted, estimated to have yielded 40,872 centners (about 2,000 tons) of copper. At the Eislebenerhütte it has been found that the water power is best utilised by means of the Cagniardelle, which is a blowing machine constructed on the principle of the Archimedes screw, as only 1 H.P. is necessary for the smelting of 1,000 *Fuder* of schist in 48 working weeks. Supposing the old bellows and blast-cylinders were replaced by Cagniardelle, the 33 H.P. available would be capable of smelting 33,000 *Fuder* of schist, by which the production of copper could be increased to at least 50,000 centners (2,500 tons).

Steam Power.—The estimate of water-power, given above, is of course subject to fluctuation, so that with the increased production of late years it has become necessary to have a reserve of steam-power, which has been put up at the most important works since 1860. The smaller works (Kupferkammerhütte, Oberhütte, and Sangerhäuserhütte) have engines of from 4 to 5 H.P., and the larger works (Eckhardthütte, Gottesbelohnungshütte) engines of from 10 to 12 H.P. These are mostly high-pressure, with or without expansion, and are generally so arranged as to work simultaneously with the water-wheels. The fuel used is lignite.

b. LABOUR:

There are about from 550 to 600 men employed at the Mansfeld works. The number of men employed at the respective works in 1859 was as follows:—

	Men.
Mansfelderhütte	132
Eislebenerhütte	88
Kupferkammerhütte..	79
Friedeburgerhütte	37
Sangerhäuserhütte	33
Gottesbeldhnungshütte } Saigerhütte .. .. }	206
Total	575

There is also a foreman smelter and a weigher at each of the works.

Each workman manipulates 300 charges a year in shifts averaging 9½ hours each. At the Sangerhäuserhütte the shifts are 8 hours.

§ 3. *Capital.*

The Mansfeld works are the property of the wealthy Mansfeld Copper Schist Mining Company, which was formed in 1852 by the amalgamation of the five following Companies: Silberhütte, Kreutzhütte, Kupferkammerhütte, Oberhütte and Mittelhütte. It is divided into 768 shares, and its head offices are at Eisleben.

M. Coingt's Apparatus for Charging Blast-furnaces and Collecting Furnace Gases.*

M. COINGT'S apparatus for charging blast-furnaces has been successively applied by the inventor at the works of Aubin (in the department of the Aveyron) and Montluçon (in the department of the Allier). Having had occasion to observe its operation in the last-named establishment, it seems to us worthy of a particular description, not merely from its obvious theoretical advantages, but also from the success that it has attained during a lengthened experience. It has, besides, been very strongly recommended by MM. Gruner and Lan, in their work on the *Etat présent de la Métallurgie du fer en Angleterre;* for, as these authors point out, this system reconciles the advantages and disadvantages of throats of a large diameter. A large throat causes a considerable economy in fuel, by diminishing the velocity of the gases, whose heat it utilises in preparing the charges for the reactions they have to undergo in the lower part of the furnace; but, in consequence of the tendency of the gases to follow the walls of the furnace, there is a central column upon which they have little effect, the extent of which increases in proportion to the size of the throat. If, in addition, the gases are taken laterally out of the furnace—which draws them still further towards the walls — the injurious effects are proportionately increased.

The old cup-and-cone distributors, so generally used in England, only partially obviate this inconvenience. They certainly produce a much greater accumulation of materials towards the circumference of the furnace, and consequently a greater permeability in the central column; but the inconvenience of collecting the gases laterally, which is so essential a part of this system, tends to neutralise these advantages. Applied to throats of a diameter of 10′, these apparatus produce, instead of a permeable column in the centre of the furnace, a space in which there is scarcely any charge at all. As these distributors were in use at Montluçon before the adoption of M. Coingt's apparatus, there have been the best opportunities of estimating the advantages of the latter.

In M. Coingt's apparatus there is also a conical distributor, but it is connected with an arrangement which allows of the charge being equally distributed towards the centre, where there is less danger of hanging, while the gases are taken from the centre. M. Coingt himself some time ago described, in the *Annales des Mines*, the apparatus erected at Aubin, from which those in use at Montluçon differ in some respects, in being more simple in their construction and rendering the charging quicker and easier. The following cuts, Figs. 1, 2, and 3, show an elevation, plan, and section of the apparatus fitted to a throat, the diameter of which, taken 6′ 6″ from the platform, is 10′. The distributor consists of the annular

* Note by M. A. Habets in the *Revue Universelle.*

hopper T T, formed of two cones with contrary inclinations, closed in a manner similar to the English distributors—that is, by two portions of cones, inclined in contrary directions, and having a common circle, the circumference of which forms a projecting edge, *a a*, in the middle of the hopper. The retaining cone is suspended by chains from the two balanced levers L L, these being retained in a horizontal position by the rod S attached to their axle, which is held in its place by the hook *r*, attached to the platform of the furnace. It suffices to unhook this to turn the lever and lower the retaining cone, which thus distributes the charge in the furnace. The average diameter of the hopper is 6′.

FIG. 1.

ELEVATION OF APPARATUS.

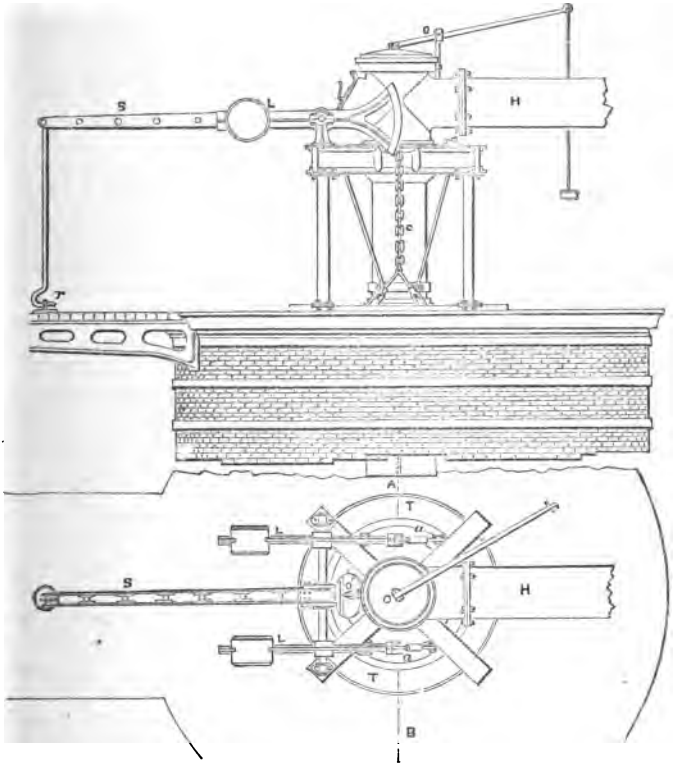


FIG. 2.

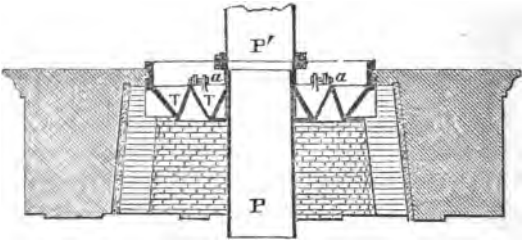
PLAN OF APPARATUS.

The gases are collected in the central cylinder P, which is slightly conical, and sunk from 7′ 3″ to 7′ 6″ into the furnace. Its diameter is from 3′ to 3′ 3″ in its lower part, and from 2′ to 2′ 3″ at the platform of the furnace, where it is connected by a collar to a cylinder of

the same diameter P′, which, at the height of about 7′ 6″, is itself attached to the horizontal tube H, which carries the gases to the boilers of the blowing engines or hot-air apparatus. The vertical cylinder is closed by the watertight stopper O, which may be opened as desired, and which acts as a safety-valve in case of explosion. One end of the horizontal tube which traverses the preceding is closed by a man-hole o′, required for cleaning the apparatus.

FIG. 3.

SECTION OF APPARATUS.



The action of the distributor is as follows:—The matters are charged to the hopper T in their order of density; first the ore, then the limestone, and lastly, at the moment of passing the charge, the coke is put in. One charge being made, the ore and limestone for the following charge are immediately placed in the hopper, where they become dried, and where, besides, they aid in keeping the hopper well closed. The latter is, indeed, perfect; and, we have observed some of these apparatus not in work which held water. The operation of charging takes place from twenty-four to thirty times per day. In the apparatus at Aubin this operation was more difficult, because it was necessary to raise the retaining cone, which M. Coingt proposed to effect by steam-power or compressed air:—in the present apparatus this is effected by the weight only. The charging is, therefore, almost instantaneous, and consequently can produce no interruption in the passing off of the gases. When the charge is being passed, the layers of ore and fuel which fall about the bottom of the central cylinder prevent any mixture of the gas with the air—a result which is favoured by the nature of the ores treated at Montluçon, which are a limonite in grains, the diameter of which does not reach half an inch, and which consequently form beds entirely impermeable to the air.

The construction of the apparatus is not complicated, and its cost of maintenance is trifling, in consequence of the moderate temperature of the gases in this part of the furnace. This temperature is, at the outside, 300° Cent. (570° Fahr.), which is insufficient to injure the wrought-iron of the apparatus.

This system entirely does away with the chimney of the throat, so that the workmen can be subject to no inconvenience either from the heat or blasts of wind.

The principal objection made to these apparatus is the difficulty f taking them to pieces, on blowing out, in consequence of the heat

they retain; but this objection is obviated by the system of blowing out employed at Montluçon, which consists in charging the ore and limestone without coke until the throat is entirely cooled. The ore and limestone thus arrive more or less calcined at the hearth, from whence they can be raked out to make way for the fresh charges.

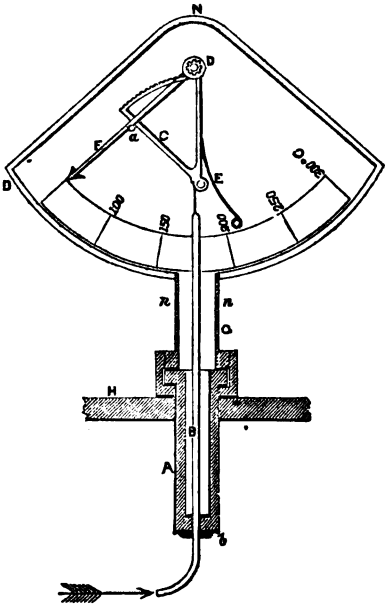
By these apparatus M. Coingt has reconciled two great steps in advance, which before seemed irreconcileable—the progressive enlargement of the throat and the collection of the gases. The dimensions of the apparatus vary with the former, with this exception, that it is not applicable advantageously to a throat of less than 6′ 6″ in diameter.

Bussius' Thermometer for Blast-furnaces.*

THIS thermometer (or pyrometer), the invention of Herr W. Bussius, Mining Engineer of Brunswick, and which will be readily intelligible from the drawing shown in Fig. 4, is specially adapted for observing the temperature of the heated air in blast-furnaces, and in other metallurgical operations. The instrument consists of a cylinder A, composed of well-baked refractory clay, made even inside and outside, but with an opening at the bottom to receive the pipe B, which is made of some metal susceptible of the greatest possible amount of expansion, and terminated upwards by a point. This pipe is connected with the bottom of the clay cylinder by a screw-thread held by the nut *b* attached to A; and its lower portion is curved and pointed in the direction of the blast. On the expansion of the metal pipe, the upper point pushes the toothed rack C, which has a small projection near its centre of rotation; and this toothed-rack moves in turn the little pinion D, on the axis of which is mounted the index-hand F. The casing G has two openings at *n n*, the object of which is to prevent the air becoming too heated in the interior which would cause irregularities in the movement of the index-hand. A ring of felt is placed between the

FIG. 4.

SECTIONAL ELEVATION OF THERMOMETER.



* From the *Berg- und Hütten. Zeit.*

casing G and the cylinder A, and also at the point where the instrument comes in contact with the support H, in order to prevent the heating of the casing. The spring E is for the purpose of bringing back the toothed-rack to its normal position.

The refractory clay having a tendency to contract rather than expand under the influence of heat, the expansion of the pipe B will fully show any increase of temperature up to the point where the heat attacks the metal. Although this instrument may not be capable of very great accuracy, it will still be found suitable for a great number of observations—such as ascertaining the heat of the blast from blowing-engines and the temperature in the interior of gas-retorts.

Lachette's Blast-furnace at Mülheim.

GREAT interest still continues to be shown in Germany with respect to this furnace, the particulars of the principle and form of which have been recently described in our pages by Dr. Beck. The performance of the new furnace at Mülheim is most anxiously watched, and at the last meeting of the Rhenish and Westphalian Natural History Society, an interesting paper was read on it by Dr. Gurlt, which we shall probably see *in extenso* in the next publication of that Society's Transactions. From a notice of this paper given in the German Journals, and from other sources of information, we are enabled to place before our readers the following particulars of the performance of this furnace up to a recent date.

During the first four weeks of working the total make of the furnace amount to about 800,000 Pfd. (400 tons) of grey pig-iron, the quality of which, as foundry metal, left nothing to be desired. The make of the 1st day amounted to 9,900 Pfd. (98 cwt.), that of the 11th day reached 19,800 Pfd. (195 cwt.), that of the 14th day 39,200 Pfd. (387 cwt.), that of the 22nd to 42,300 Pfd. (418 cwt.), and that of the 25th to 45,600 Pfd. (450 cwt.) Subsequently, in consequence of the use of poorer ores being adopted, the make dropped back, on the 30th day, to 42,300 Pfd. (418 cwt.). Indeed, all through its working, this furnace has suffered from a deficiency of the richer ores, and the favourable results so far attained, as shown by the above figures, are entirely attributable to the peculiar features of the furnace, and to the energy and skill displayed in overcoming the many difficulties which had to be contended with. The credit is mainly due, in this latter respect, to the constructor of the furnace, M. Charles Aubel, of the firm of Messrs. H. Elfes and Co., who has, after three months working, guaranteed a daily make of from 36,000 Pfd. to 40,000 Pfd. (350 to 400 cwt.) of grey pig-iron—a make which, as has been shown by the figures given above, had been attained in the third week of working.

As to the important question of the consumption of fuel, the saving of 12% as compared with the consumption in the old form of

furnace, which was guaranteed by the inventor, has not yet been realised. This is accounted for by the explanation that the furnace had not yet been got into full and proper working condition, and also that the ores used were such as required, on an average, from 50 to 55 Pfd. of limestone flux per 100 Pfd. of ore. Taking the circumstances stated in this explanation into consideration, the consumption of fuel, which amounted to 1,500 Pfd. (15 cwt.) of Westphalian coke per 1,000 Pfd. (10 cwt.) of grey pig-iron made, cannot be considered as unsatisfactory. With respect to the saving of fuel in this furnace, it is also important to bear in mind that it only requires a very low pressure blast—from 1¼ to 1½ Pfd.—while the furnaces of the ordinary form require a blast of double that pressure. Hence at the new Mülheim furnace half the fuel formerly required for generating steam for the blast-engines is now saved.

In noticing these results, which may on the whole be considered decidedly favourable, we must not omit to state that they are universally considered to be, in a great measure, due to the indefatigable energy of M. Aubel, and of the chemist of the works, Herr Lange. The numerous strangers who have visited the works to witness this important trial unanimously acknowledge their obligations to these gentlemen for the readiness with which every information was afforded them. It is much deplored, therefore, in Germany, both in the interest of the success of the work and the information of the public, that Messrs. H. Elfes and Co. should have withdrawn their permission from M. Aubel, and recalled him from the management of the Mülheim furnace from the beginning of June; particularly as he was himself willing to have continued to afford the advantages of his superintendence for two months longer, in order that he might have left the work in the hands of persons whose capacity and experience he had had the opportunity of thoroughly testing. It is true that M. Aubel leaves behind him a thoroughly trained staff; but still it is a matter of great regret that by this change, in the superintendence of the working of this experimental furnace, there will be much difficulty in correctly ascertaining the facts relating to its future working.

It is to be hoped that the Company will now take measures to procure for this furnace such a class of ores as have been repeatedly, but vainly, applied for by M. Aubel. With such ores, and the trained staff M. Aubel leaves behind him, it is to be hoped that such results will yet be attained as might have been looked for with certainty under that gentleman's personal management.

Abstracts and Reviews.

INFLUENCE OF FLUXES ON MANGANIFEROUS PIG-IRON.

Some time ago M. H. Caron ascertained by experiment that manganese expelled sulphur and often silicium from pig-iron. It consequently becomes interesting to find the means of making, from manganiferous ore,

a pig-metal charged with a maximum of manganese, since this metal would have a so much greater value as a purifying agent. Recent investigations of M. Caron have shown him that two causes principally influence the richness of the pig in manganese: 1st, the flux employed in the reduction of the ore; 2nd, the temperature at which this reduction takes place. From the evidence we are about to adduce it will be seen that, in order to obtain from a given ore pig-iron richest in manganese, as much lime must be used as a flux as is possible without injury to the fusibility of the slag; the temperature also during reduction must not be too high. As the proportion of silicious flux is increased, the proportion of manganese decreases, being replaced by the silicium; and the same is the case when the temperature is too high. The ore which M. Caron treated was a carbonate of iron and manganese having the following composition:—

Carbonate of Iron	71·00
Carbonate of Manganese	13·30
Carbonate of Magnesia	11·20
Carbonate of Lime	·20
Silica	4·30
	100·00

Several kilogrammes of the ore were finely powdered and carefully mixed; in each experiment the same quantity of ore was treated; the fuel mixed with the ore was treated under the same conditions; and, lastly, the crucibles were all brasqued with a mixture of gas-retort, graphite, and coal-tar.

Flux.	Colour of the Pig-Metal.	Manganese.	Silicium.
		Per cent.	Per cent.
No. 1. Carbonate of Lime .. 10	White	7·93	0·05
No. 2. Carbonate of Lime .. 5	White	6·32	0·08
No. 3. Fluoride of Calcium .. 5	Mottled	4·70	0·30
No. 4. Silicious Earth 5	Grey	3·81	0·55
No. 5. Silicious Earth 10	Very grey	2·25	0·76
No. 6. Silicious Earth 5	Grey	3·90	0·50
No. 7. Silicious Earth 5	Grey	2·10	0·75

In experiments Nos. 1 to 5 inclusive, the temperature was about the same; in No. 6 it was as low as possible while sufficient for the pig to run together; in No. 7 the temperature was as high as possible.

The colour of the pig-metal, according to the flux employed, is worthy of remark. Lime in sufficient quantity gave white metal, while silica gave grey metal. A mere alteration of the flux, therefore, the temperature being equal, would furnish at will white or grey metal, iron for the manufacture of steel, or iron for the manufacture of bar iron, at least in treating manganiferous ores.

Smelters, therefore, who treat mixtures of highly manganiferous and ordinary ores (sulphurous or silicious) in order to improve the quality of the products, may, without fear, progressively increase the quantity of limestone; if the fluxes, thus modified, were too refractory it would be sufficient to add a little common salt or chloride of calcium to render them sufficiently fusible; the same quantity of ore was treated; the fuel mixed with the ore was treated under the same conditions; and lastly, the crucibles were all brasqued with a mixture of gas-retort graphite, and coal-tar.

ANALYSES OF ZINC ORES.

The following analyses of zinc ores have been made at the *Ecole des Arts et Manufactures et des Mines de Liége*, under the direction of M. Js. Kupferschläger. We give the results for the sake of convenience in a tabulated form :—

	a.	*b.*	*c.*	*d.*
Analyses by Wet Method.				
Volatile matters	20·28	—	4·77	6·15
Insoluble ditto	—	—	23·82	—
Clay	11·76	—	—	24·80
Oxide of Zinc	53·79	—	53·02	58·77
Oxide of Iron	5·36	—	10·94	2·60
Oxide of Manganese	2·19	—	—	tr.
Alumina	2·21	—	3·16	0·90
Lime	2·68	—	2·56	2·60
Magnesia	0·75	—	0·92	1·30
	99·02	—	99·19	97·12
Zinc: *by Volumetric Method*	42·93	48·69	43·85	47·11
„ *by Dry Method*	41·99	—	43·77	41·60

	e.	*f.*	*g.*	*h.*
Analyses by Wet Method.				
Volatile matters	5·89	—	—	13·30
Clay	20·77	—	—	9·93
Oxide of Zinc	42·82	—	—	—
Oxide of Iron	20·90	—	—	—
Oxide of Manganese	2·36	—	—	—
Alumina	2·29	1·87	—	—
Lime	2·27	—	—	2·00
Magnesia	2·69	—	—	—
Silica	—	1·50	—	—
Sulphur	—	33·91	—	26·00
Zinc	—	50·75	50·57	41·72
Lead	—	5·33	—	3·00
Iron	—	5·77	—	4·00
	99·89	99·12	50·57	99·95
Zinc: *by Volumetric Method*	35·57	51·61	52·19	41·09
„ *by Dry Method*	36·98	51·36	53·45	39·70

a. Calamine from Moresnet.—Ore in lumps the size of the fist; colour varying from yellow to brown; lustre dull; density and hardness medium. This ore forms in two beds, separated by scales and small crystals; texture compact, and powder yellowish. Effervesces with acids.—Average result of sixteen assays.

b. Calamine from Croatia.—Ore greyish-white; density inconsiderable;

not very hard; effervescing with acids.—Average result of four assays made by the volumetric method only.

c. Calamine from Almeria (Spain).—This sample was in rather fine powder of a yellowish-red colour, considerable density, and scarcely effervescing with acids.—Average result of ten assays.

d. Red Calamine from Almeria.—This sample was in a very fine bright red powder, and scarcely effervesced with acids.—Average result of three assays.

e. Calcined Calamine from Almeria.—This ore was in grains of a reddish-brown colour, with an earthy aspect; density rather considerable; hardness inconsiderable; effervesced with acids.—Average result of fourteen assays.

f. Raw Blende, with Galena and Fine Sand from Spain.—Ore in coarse powder, with the appearance of a mixture of grains of an iron-grey metallic aspect, with others of an earthy aspect of a brownish-yellow colour, and finer than the former.—Average result of four assays.

g. Calcined Calamine (another variety), with galena and coarse sand, from Spain.—Average result of four assays.

h. Raw Blende from the Saturn Company at Cologne.—This sample was in a coarse powder, of a blackish-grey colour; dull; of a medium density and hardness; effervesced with acids.—Average result of nine assays.

ANTIMONY IN AMERICA.

A recent number of the *American Journal of Science and Arts* has a notice by Mr. Charles Upham Shepard, of Amherst, on the antimony ores found in the United States and Canada. The knowledge of this metal being found in North America is in itself rather recent. Antimonite (sulphide of antimony, $Sb\ S^3$), has been reported from a place called Soldier's Delight in Maryland, and from Carmel (Penobscot County), Maine; and about fifteen years ago very distinct specimens were brought from Cornish, New Hampshire, by Prof. F. Shepherd. Breithauptite (antimonial nickel, $Ni^2\ Sb$) has also been known to exist for several years at the nickel mine at Chatham, Connecticut. But in none of these localities was there any prospect of the metal being found in workable quantities.

Recently, however, an antimony mine has been discovered at South Ham, in Canada East, about 30 miles distant from either the Danville or Athabaska stations on the Quebec branch of the Grand Trunk Railway. Mr. Hitchcock describes this mine as being situated in the common talco-micaceous schists of the Quebec Group of the Lower Silurian, bearing N. 55° E. and dipping N. 35° W. These strata are traversed by three metallic lodes, having various bearings, but intersecting one another so as to form a triangular space. One of these lodes, which has been traced half-a-mile in a direction bearing E. 15° N., has been opened on by a trial shaft to a depth of 15 feet, where it shows an increase of from 18 inches to 3 feet, with very distinct walls. The other two lodes are very much smaller, and course N. E. and W. 28° S. The dip of the lodes is variable, but the first and second dip towards each other. The intersection of the veins has not been opened on.

West of the lodes, higher up the hill, is a small bed of serpentine, across which none of the lodes have been traced, and which probably cuts them off, as the gangue of the lodes again appears on the west side. This gangue is mostly a quartz rock of a dark bluish tint. The form in which the antimony occurs is usually that of the native metal, which is disseminated through the gangue, generally unostentatiously, but occasionally both in large and small lumps. Dr. Hayes' assays show that very unpromising

portions of the gangue yield 80% of antimony. The richest portions of the lode vary in position, sometimes being on the foot, and sometimes on the hanging wall. The ores of antimony also occur, but not in workable quantities.

ON THE MECHANICAL AND CHEMICAL TREATMENT OF GOLD AND OTHER METALS.

(From a Letter to Prof. B. Silliman, junr., from James D. Whelpley, in the *American Journal of Science and Art* for May).

Agreeably to your request, I send you herewith a few memoranda in explanation of our new process for preparing quartzose ores of gold for amalgamation.

This process, so far as I am aware, together with all the machinery employed in it, was invented and constructed by Col. J. J. Storer and myself.

Our researches in this direction began in the spring of 1860, in Philadelphia. We experimented for several months upon a small scale, testing most of the then known processes for reduction and desulphurisation of ores. It then appeared to us, that processes requiring long periods of time, such as are employed by skilful chemists in the laboratory, could not be applied to large mining operations, where masses of several tons have to be treated at one operation.

A few grains of sulphuret of iron or copper heated to whiteness in a platinum capsule will be thoroughly desulphurised, but a mass of ore weighing several thousands of pounds cannot be handled in this manner. The ore fuses in the furnace, taking the form of slag, and holds the sulphur confined in its substance,

If, on the other hand, the finely pulverised ore be spread thinly over a hearth 14′ in length and 8′ or 10′ in diameter, with free access of air, and the heat either radiated from the roof or passing up through the hearth of the furnace, a very thorough desulphurisation may be effected, by constant turning and exposure of fresh surfaces, taking care that the temperature does not exceed a cherry-red heat.

A large access of atmospheric air is necessary for the management of this process, and it is aided by the addition of chloride of sodium and other reducents. Though perfect in the end, it is exceedingly expensive and tedious, because of the care required in regulating temperature and handling of the material.

The results of the experiments with this last process were, however, very valuable to us. We discovered that the first condition of thorough desulphurisation was the reduction of the ores and sulphurets to an *impalpable powder*. The reason of this is evident, viz., that the effect of heat upon a particle increases inversely as the square of its diameter.

Microscopic atoms are readily acted upon by combined air and moisture at a cherry-red heat. Pieces of the size of mustard seed will resist the action of the best managed furnace for hours, and the difficulty increases with the size of the particles directly as the squares of their diameters.

A theoretically perfect process, therefore, requires:—

1st. That every particle shall be microscopically small,—in the condition of fine floating dust.

2nd. That the particles do not touch each other while hot.

3rd. That when metallic grains, as of gold or copper, have to be separated from the ore, the contact of water with the heated particles is necessary.

We constructed a furnace in which finely pulverized ore-dust was

floated in a current of hot air and flame, passing down through a flue leading from a hard coal fire at an angle of about 45°, and then resting upon a horizontal hearth or sole.*

We discovered at this time that moisture or the vapor of water in large quantities materially aided the process of desulphurisation in free air, and we constructed and applied a steam apparatus, by which a volume of steam was made to pass down the inclined flue with the ore-dust, the atmosphere and the products of combustion.

At this point we encountered several serious difficulties. The inside of the inclined flue became lined with stalactoid masses of semi-fused ores, and the sole of the furnace caked and covered with the same. When a certain quantity of burnt ore had accumulated on the hearth, a trap was opened and the heated mass pushed through into a water-bath. The agglutinated masses on being withdrawn from the bath were reground, and passed a second time through the furnace.

A sufficiency of atmospheric air could not be applied through the furnace doors, and a very large percentage of the ores escaped through the chimney into the open air.

The last of these difficulties was overcome by placing a powerful fan wheel of copper (which served also as a water or spray wheel) in the chimney itself, or in a chamber of it, and by carrying the horizontal flue some 75′ beyond this wheel.

The steam from the furnace and the spray from this wheel, working over a pool of water, which formed the floor of a horizontal flue, effectually wetted down and saved the flying dust of ore.

The brick-floor or sole of the furnace was abandoned, and a water-floor substituted. Over one end of this pool or water-hearth a perpendicular flue was erected, from 12′ to 15′ in height above the surface of the water.

The flames of four fires were poured into the top of this flue by the effect of two fan wheels; the first, the copper spray-wheel already spoken of; the other, an auxiliary fan blower, sending air into all the fire-boxes. The top of the furnace was left open, and a column of air bearing pulverised ore, driven directly from the *pulverising mills* down through the centre of the perpendicular flue.

The operation of this machinery balanced and regulated the force of the draft so well, that while ore-dust was driven in at the rate of 1,200 lbs. an hour, carrying with it an excess of atmospheric air, if a side door of the descending flue were opened, a feather would float in the opening without being blown either way.

We then discovered that the immediate quenching of the fused particles of ore by the water in the pool and in the chamber beyond, was essential to a thorough separation of the metals. The heated particles on touching the surface of the water are exploded into still minuter fragments, a degree of fineness unattainable by any other means. *The entire apparatus is constructed with a view to this result.*

The water lining the bottom of the flues is a circulation completed by an outside canal. The water, thrown up from the copper dash wheel returning circuitously, falls back into the furnace pool. This water, after some time working of the furnaces, is of course charged with sulphates of iron, copper, and other metals. The insoluble metal falls to the bottom with the sediment, which is composed chiefly of silica and iron. In this sediment the gold will be found ready for washing and amalgamation.

The sediment is drawn out by the workmen as fast as it accumulates through the submerged arches on which the brick-flues or water-chambers are established.

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* This furnace was built and worked in Charlestown (Mass.) in May, June, and July, 1861.

The condition of the sediment is that of a smooth plasma without grit or coarseness of grain. Using only floating dust, 10 tons can be worked in ten hours with these results in a furnace of the size indicated. More extensive machinery would give larger returns.

We built our flues and water-beds under the furnace, and also under the horizontal brick archway leading therefrom to the spray-wheel, of common brick, thickly covered with ordinary hydraulic cement. We found this a very good lining for the descending flue or "drop." The spray chamber beyond the dash wheel was built of wood over a brick and wooden water channel 75′ long, 6′ wide, and from 20′ to 30′ high. This was filled with vapor of water and sulphurous acid from the furnace pools, which made a fine rain, carrying down any minute ore-dust which might escape the action of the dash wheel, also condensing large quantities of sulphuric acid from the sulphurets.

The gold ores most free from sulphurets are easily worked. When the sulphur is in excess, the supply of air and moisture must be proportionately large.

In regard to fuel, the finer the ore-dust before burning, the more economical the process.

In places where wood alone is accessible for fuel, the fire-boxes should be from 20″ to 30″ deep, below the fire-bridges, 8″ for coal.

Crushing Machinery.—For crushing gold ores previous to fine grinding, any ordinary crushing machinery may be employed that will reduce them to pea or gravel size, as they must not be larger than this before entering the *pulveriser*.

The crushing mill used by us is a patented invention of my own. It consists of a very heavy and solid bar of wrought-iron, revolving in the bottom of a cast-iron tub as close as possible to the sides and bottom of the tub.

This bar carries at either extremity a hardened steel or chilled-iron plate, with a cutting edge welded to a soft iron back to prevent rupture.

The sides of the tub are pierced with holes from an inch to half an inch in diameter, forming a coarse sieve.

Two of these bars may be used crossed, working *four* cutters, held together by a cast-iron centre piece of great strength and solidity, through which an upright shaft passes, furnished with a step and a pulley. The speed of these cutters is a little more than 10,000′ a minute. The broken pieces of quartz are thrown out of the holes in the side of the tub at the rate of *five* tons an hour.

Pulverising Machinery,—The pulverising of the crushed ore is performed by flat plates of thin iron faced with chilled iron, attached to radiating arms, somewhat like the paddles of a steamboat wheel. These revolve inside of a cast-iron drum, as close as possible to one side and very near its circumference. A horizontal shaft passes through the centre of the drum.

The material, gravel size, is poured in on one side of the axis by an automatic hopper, which measures the quantity.

A powerful draft of air forced through the machine by a fan blower forming an essential part of the apparatus, draws out the dust through a hole on the opposite centre of the drum, where the shaft also passes.

The dust is then carried by this fan blower and driven into the top of the furnace. The minimum rate of delivery for a mill of ordinary *size* is 1,500 lbs. an hour.

Of this last machine I cannot give you a more minute account, as its successful operation depends upon interior details, obtained by long and costly experiments. The maximum rate of production we have not yet ascertained.

All the new and important features have been patented by Col. J. J. Storer and myself.

As soon as possible, I will furnish you with working plans of the furnaces built and worked by us. We have ground the hardest copper ores of Vermont, and the quartz of Nova Scotia in our pulverising mills. I know of none more difficult of reduction.

REPORT OF THE UNITED STATES' COMMISSIONER OF PATENTS.

The Introductory Report of the United States' Commissioner of Patents for 1863, forms an interesting summary of the progress of invention in the States—at least as far as it is represented by the issuing of patents. The following extracts from this report, bearing on matters connected with our subject, may be of interest to our readers.

Hydraulic Machinery—In water wheels, the improvements relate chiefly to modifications of turbines and centre discharge wheels. One of these shows the wheel suspended upon a hollow column, through which the vertical shaft passes, to which shaft a collar is attached, resting upon the upper end of the hollow column. This collar may be elevated and depressed by means of set screws so as to adjust the wheel in position and prevent leakage. In other cases, by means of ball governors, the gates surrounding a vertical wheel are opened and closed, and the flow of water regulated. In one instance a vertical wheel is arranged with an annular space around it. Within the inner wall of this space an elastic diaphragm surrounds the wheel, which consists of three arms, each having a roller at its end held to duty by a spring in the arm. These rollers press the diaphragm out against the wall as they revolve, and the water flows behind them through ports leading from the annular water space without. In centre discharge wheels, the improvements consist generally in various modifications of cams for opening and closing the swinging buckets as they recede from or approach the stationary abutment, and in suspending the wheel from the upper end of the shaft on friction rollers or otherwise. In many of these wheels, however, the chutes that guide the water to the wheels are stationary, and the buckets are fixed in relation to their radius. Another modification of the vertical wheel consists in admitting the water at the bottom and permitting its discharge from the top, the buckets being spiral; and a variation of this consists in placing the wheel some distance below the level of the stream, and conducting the water through it from its base to a distance above the surface of the stream by means of an annular passage placed over the buckets, the object being to take advantage of the momentum of the falling water. In an overshot wheel the buckets are so formed as to retain a considerable portion of the water until the bottom of each successive bucket is in a perpendicular position under the wheel; and to this end an aperture in the bottom of each bucket permits a portion of its water to fall into the bucket next below rather than fall by overflow directly to the ground.

Metallurgy and Mining. — The inventions in this class relate to processes and apparatus for roasting and smelting ores; refining iron and making steel; the making of new alloys; the washing and separating of ores; and for amalgamating and collecting the precious metals. About fifty patents have been allowed during this year in this class, some of them for very valuable improvements.

In roasting ores an important improvement has been made, which consists in passing the ore in fine powder through flame, or the hot gases from combustion. By this process each minute particle of ore is roasted by itself, and the result is that the roasted ore is in fine powder instead of being in an agglomerate mass, as it is when the ore is roasted in a heap. It is well known that but a small part of the gold in pyritous ores is

obtained by the ordinary modes of working. If not roasted, the gold is encased in the sulphurets so as not to be reached by the mercury. If the ore has been roasted in the common mode, the incrusting stay or earthy oxides still protect the gold, to a great extent, from the action of the mercury. By the new mode of roasting, it is believed that the precious metals will be found diffused through the fine powder in globules of easy access to the mercury.

The powdered ore may either be blown through the flame from a reverberatory furnace, or it may be allowed to fall through a shaft, and then be acted upon while falling by flame and hot vapours or gases. Immediately after the ore leaves the flame it is thrown or falls into water, whereby the earthy matters in it are further disintegrated.

The production of iron and steel has been greatly advanced during the year. The principal aim of inventors has been to produce the better qualities of iron, and, especially, to make iron possessing many of the qualities of steel.

It has long been an object with inventors to make malleable iron on a large scale directly from the ore, instead of making first pig-iron, or cast metal, and then burning out the carbon in it by puddling or other means. Several patents have been issued for accomplishing this. These are on the principle, not now new, of reducing the ore by the hot products of combustion, yet keeping the temperature so low as not to fuse the mass of ore. When reduced, the metal is raised to a welding heat, and at once formed into blooms, one fire serving both for the welding and the reducing processes. Several minor improvements have been patented on the Bessemer process.

Three patents have been issued for making steel, by combining in different modes cast and wrought iron, the novelty consisting only in the mode of effecting the result. One of these processes consists in heating in a crucible the wrought-iron to a white heat, and then letting into the crucible pig or cast-iron directly from a blast-furnace or cupola. Another inventor makes a kind of steely iron, by melting together, in proper proportions, particular kinds of cast-iron and bar iron. The third process consists in treating the cast-iron on the puddling hearth until it becomes granular and spongy, then throwing it into water, and reducing it to powder. This powder is then enclosed in a wrought-iron box, which is subjected to a welding heat, and the box and its contents placed under the hammer.

Two patents have been issued for new alloys of the metal aluminum. By one of these very close imitations of gold are obtained. The other is for an improved gun-metal.

About twenty patents have been issued for improvements in gold-washers, ore-separators, and apparatus for collecting gold and silver by the process of amalgamating them with mercury. Compared with former years, this shows increased interest in mining for the precious metals. Several of these improvements are for the new mining fields of Nevada and Colorado Territories.

For grinding and amalgamating at the same time, all the known machines have received improvements. The ordinary tub and corrugated muller is more used in California, but not to the exclusion of the arastra and German barrel. In washers and separators the gig-mill seems now to be the favourite, though the old-fashioned ripple and sluice machines have received considerable attention.

In machinery for drilling rocks there are improved devices for holding and rotating the drill and adjusting it in a more or less inclined position. By another device the drill is made to act upon the rock by uniform blows throughout the entire depth of the hole to be drilled, the drill being rotated and fed to its work by automatic machinery.

Extracts, Notes, and Memoranda.

ARTIFICAL STONE FROM FURNACE-SLAG.—For some time past numerous attempts have been made to utilise furnace-slags. In districts where the soil is argillaceous and silicious, and limestone rocks are wanting, slag is sometime used for macadamising the roads; but it is not very suitable for this purpose. It has also been attempted to make it into tiles by running it into moulds as it comes from the furnace. Some recent experiments by M. Montefiore seem to hold out good prospects of converting it into artificial stone suitable for building. To effect this, the slags are melted in a mass and then left to cool slowly; and from this mass blocks are cut out which are worked like ordinary building stone. M. Montefiore has forwarded to the *Conservatoire des Arts et Metiers*, Paris, several specimens from the Noveant and Aulnoye works, which have been submitted to a regular course of experiment in order to ascertain their power of resistence. Those from Aulnoye (in the department of Moselle) only cracked under an average pressure of 315·91k. to the square centimetre (4,483 lbs. to the square inch), and were only completely crushed under a pressure of 508·29k. (7,213 lbs.). Those from Noveant (in the department of the Nord) showed a still greater power of resistance, being only crushed under a pressure of 684 k. (9,708 lbs.). The stone is very hard, and possesses greater power of resistance than the best limestone. It would be very important to metallurgical works if M. Montefiore's experiments should be found generally applicable, even if they had only the result of reducing the enormous heaps of cinders which now accumulate to such an extent as often to form regular mountains.

A NEW QUARTZ MILL.—The San Francisco *Mining and Scientific Press* reports that a quartz mill has been exhibited in that city, which is a combination of the vertical crushing rollers of the inventor, Mr. Scovill, with a Chili mill, which grinds against the surface of the trough as well as against its bottom; it has also a further trough for amalgamating the gold. The whole machine may be set up by three men in as many days.

MANCHESTER GEOLOGICAL SOCIETY.—The monthly meeting of this Society was held on May 31st, Mr. A Knowles in the chair. A paper was read by Mr. J. Goodwin, on the subsidence of the surface consequent upon the working of coal mines, in which he stated that under any system of working coal the surface must necessarily be lowered; all that engineers could therefore do was to lessen the damage to property by changing the breakage line, for the mere act of subsidence would of itself produce little or no injury. Long experience had shown that damage to the surface might be lessened by removing four-tenths of a seam, and leaving the remainder for the purpose of changing the direction of the breakage. In some mines it would not be necessary to leave more than half the coal; working, for instance, for twenty yards and leaving twenty yards standing. The paper was illustrated with diagrams, to show the angle of breakage and how far it would extend on the surface from the point immediately above the point to which the coal had been worked.—In the course of the discussion which followed, Mr. Greenwell said that different systems must be adopted to change the breakage line according to the manner of getting the coal, the system for pillar and stall might not suit for long-wall work. —Mr. J. Dickinson said he once a read a paper on this subject to the society, and the observations he then made were confirmed by subsequent experience. He gave instances where the breakage line had been in the "rise," instead of, as ordinarily, in the "dip," and said that he had even seen subsidence where workings had been 600 yards deep. The subsidence

caused by working a 4′ seam at a depth of 200 yards was about 3′.—The Chairman and one or two or others expressed an opinion that a mine ought to be so worked that the whole area of the surface above it should sink at the same time.

Refining Pig-iron.—Mr. G. Parry, of the Ebbw Vale Ironworks, has patented some improvements in refining crude pig-iron, in the application of which much less blast being used for a given weight of iron than usual, a great saving of fuel is effected, and the steam is so applied and regulated that, as a refining agent, it becomes more efficient than with the old method. In carrying out the improvements a reverberatory furnace is used, built, by preference, in front of the blast furnace, into which the molten metal is run to the weight of from 30 to 40 cwts. The reverberatory furnace is constructed rather larger, but similar in form to an ordinary puddling furnace, but with this difference, that both the fire bridge and flue bridge are raised much higher than usual, the object being to direct the gas flame from the fuel perpendicularly upon the face of the molten iron that is being refined. Instead of using six ordinary blast water twyers of 1¼″ diameter, as in the old refineries, in this furnace two twyers are found to be sufficient. One or two steam twyers are also used for injecting steam heated to about 500° or 600° Fahr. These steam jets are inserted in the axis of a water twyer in such manner as to form an annular passage for an induced current of air from the atmosphere to pass down with the superheated steam, and mix with it before it strikes the surface of the metal. By this admixture of the superheated steam and air the refining effect of the steam on the iron is very much increased, as is shown by the increased heat and brilliancy of the twyer under this arrangement over the ordinary way of applying steam. Previous to running in the charge of metal, 2 or 3 cwts. of forge-cinders are introduced and thoroughly heated, but not quite fused (to save the bottom of the surface from too much wear); the metal is then run in, and the blast turned on. When the molten iron shows a rapid increase of temperature the steam is to be introduced, and the supply continued while the iron maintains its fluidity and heat unimpaired, but otherwise must be checked or stopped altogether. The refiner, with a little practice, will judge for himself what quantity of steam the iron will take, and also will see that different kinds of iron will bear different proportions of steam. In general, the more steam that can be blown into the iron the greater the degree of refinement. The steam also exercises a powerful refining action on the forge-cinder used in the refinery furnace, fitting it for further use in the smelting furnace. Water blocks are used to preserve the brickwork in the bridges and partly in the roof of the refinery, and the coil of pipe used for heating the steam may be heated by the spare heat of the chimney.

Great Mass of Native Copper.—The following particulars respecting the great mass of native copper discovered at the Minnesota Mine, have been communicated by Mr. J. B. Townsend, the agent of the company. The "great mass" of the Minnesota Mine was discovered in February, 1857, between the adit and 10 fm. levels, or about 20 fms. from surface, imbedded in the belt of conglomerate which forms the foot-wall of the Minnesota vein. Previous to the discovery, the regular vein at the junction of the trap and conglomerate had been removed; the foot-wall, at the place where the great mass was found, being as perfect and regular as in other places, and the lode itself being also rich in mass copper. The "great mass" was discovered by small strings of copper being found extending from it into the conglomerate. The mass itself was 45′ long, about 22′ at its greatest height, its thickest part being more that 8′. It gave a produce of upwards of 90 °/₀ of fine copper, weighed 420 tons, and took thirteen months in cutting up and sending to surface. At first some

thirty men were employed in cutting, but later on only a few could work at a time. Several heavy blasts were necessary to loosen it from its bed; 2,375 lbs. of powder having been consumed, of which 75 lbs. were used at the last blast. The distinguishing features of this great mass, compared with others, were—its great weight in one solid body, its remarkable purity, and its occurring in the conglomerate rock outside the vein.

CHEMICAL RELATIONS OF TUNGSTEN.—A recent memoir by Persoz on tungsten and its compounds gives among others the following results, differing essentially from those hitherto received by chemists:—

1. That tungsten belongs to the group of biatomic radicals—arsenic, antimony and phosphorus—and that its equivalent (O = 100) is 1916;

2. That it forms two compounds with oxygen—tungstic oxide (WO^3) and tungstic acid (WO^5), and that the union of these two oxides may produce a third oxide, of the class of saline oxides of Dumas, of the formula $WO^3 + WO^5 = 2WO^4$;

3. That tungstic acid is polybasic, and may, like its cogeners phosphoric and antimonic acids, be physically modified by heat, so that its capacity of saturation is reduced one half, in which state it may give rise to a new (metatungstic) acid, the formula of which is $(WO^5)^2$ or W^2O^{10};

4. Sulphur, chlorine, and bromine combine with tungsten, producing compounds which correspond exactly to the oxides and acids formed with oxygen.

CUTTING AND BORING COAL AND ROCKS.—Mr. J. Sturgeon, of Leeds has patented some improvements in coal and rock-cutting machines to be worked by compressed air, by which the valve gearing will be rendered self-adjusting, to suit different lengths of stroke; and the traverse, or feed motion of the machine, to keep the cutting tool up to its work, will be so regulated that the tool must first penetrate a certain determinate depth into the coal or rock before the machine can advance. The valve gear which is employed for working the air engine of the coal-cutting machine is an adaptation from an improved steam-hammer, patented by Mr. Sturgeon in May, 1863. The rapidity of action which this adaptation imparts to the cutting tool necessitates a self-acting traverse motion, which may with advantage be employed when the valves are worked by hand. To ensure the self-adjustment of the valves for working the engine, in the first place, that part of the valve-motion which reverses the valve for the back stroke is connected with the piston-rod, so as to cause it to traverse with it, and thus be in a position for reversing at any point in the stroke; and, in the second place, the shock caused by the cutting tool striking against the coal or rock is used to set in motion an arrangement of rock levers, whose office is to transmit this sudden motion to the valve rod, and thus reverse the stroke. This arrangement of levers carries a bowle, which, by striking against a fixed stop at the completion of the reverse stroke, again shifts the position of the valves and produces the return motion of the piston. The feed motion is arranged in the following manner:—A pawl or ratchet, actuated directly from the piston-rod of the engine or first mover shaft, is so arranged that at any required point in the stroke it will be allowed to fall into the teeth of and drive a ratchet wheel keyed to a shaft, which is connected by any ordinary arrangement of gear wheels with the carrying wheels of the machine. The axial motion, therefore, of this shaft will impart a corresponding traverse motion to the machine, which may run upon rails or ways. The ratchet wheel is mounted between two adjustable fixed segment guides, which are so shaped as to keep the pawl or ratchet out of the teeth of the ratchet wheel until the determined length of traverse of the cutting tool has been effected. This pawl is fitted with a compound stud, one end being rigid, and the other capable of yielding to end-way pressure. The yielding end slides upon one of the said segment

guides, and the rigid end upon the periphery of the other. So long as the traverse of the tool is short of the determinate distance, the pawl will be supported by the yielding stud out of action; but when the proper length of stroke is obtained, the pawl will drop or be forced inwards, its stud coming in contact with the segment guide of smaller radius. In traversing over this guide, the stud will meet a depression, and the pawl will then be thrust into contact with the teeth of the ratchet wheel before mentioned. In the continued traverse of the pawl, the requisite axial motion will be imparted to the ratchet wheel for communicating the traverse motion to the carrying wheels of the machine, and thus giving the proper advance to the cutter, and the ratchet will then be raised to its elevated position, the stud yielding to allow of that elevation. To provide for the proper traverse of the machine when the stroke of the tool is shortened, the segment guides are made capable of adjustment of a shorter stroke.

A CALIFORNIAN DIALOGUE.—A Californian paper reports the following dialogue as having taken place in Montgomery Street, the "Corner" of San Francisco, between a "spirited, go-ahead, never-desponding broker, and a cross old gentleman, who was a heavy purchaser in Wide West Chollar, and similar claims, and lost largely. *Broker*, with a smile on his face, approaching the old gent, 'How are you Mr.——? I have one of the nicest little chances for you to make money, in the way of a mine, and if you like I will take pleasure in *letting you in*.' *Old Gent* raises his specs, takes a good survey of the broker, and says: 'Go to the d—l, sir! There have been enough brokers already, who have taken great pleasure in *letting me in*!' Broker makes his exit, with a flea in his ear."

GEOLOGICAL SURVEY OF CALIFORNIA.—From Prof. Whitney's last report to the Governor of the State, on the progress of the Geological Survey of California, we learn that during the last season labours had chiefly been directed to extending a reconnoissance over as large a portion as possible of the previously unexplored region of the State, with which aim attention was chiefly devoted to the Sierra Nevada, from Fort Tejon to the northern line of the State, particularly between the parallels 37° and 40°. During the latter part of the season, Prof. Brewer had been employed in completing the map of the vicinity of the Bay of San Francisco, which is now ready for the engraver. The map of the vicinity of Monte Diablo, on a scale of two inches to a mile, is also ready for the engraver. A large amount of material had likewise been collected towards a map of the central portion of the Sierra Nevada. As to the amount of time and money required to complete the work, that would depend on the degree of accuracy sought to be attained, bearing in mind that it includes a topographical as well as a geological survey. The furthest limit ever aspired to was a map of the whole State on a scale of six miles to an inch, with geology worked out with corresponding accuracy; but experience soon showed the impossibility of getting such a scheme carried out by the legislature, as it would certainly take at least fifteen years to accomplish. Hence the estimate has been reduced to four years longer in time, and an appropriation of not less than $40,000 a-year. With these means, a map of central California, from parallel 37° to 40° 20′, might be prepared on a scale of three miles to an inch, which would embrace an area occupied by nine-tenths of the population of the State. It might be possible also to complete the map of the Coast Ranges, from Santa Barbara to Monterey. Of the important mining districts, including that of Washoe, detailed maps would be given. The main object, however, would be the elucidation of the mineral resources of the State, including everything bearing on the working of mines and the reducing of their products to a marketable condition. This programme having been agreed to by the legislature, the results of the survey will probably be comprised in five large volumes—the third volume of which will be devoted to economical geology, including all

that relates to mines and mineral products of economic value. The total amount appropriated for this work, up to the present time, has been $70,000. But out of the $20,000 appropriated by the last legislature, not one dollar had been yet paid, although the expenses incurred had been upwards of $16,000. Such were the delays and anxieties caused by this behindhandedness of the State in their payments, that Prof. Whitney recommends that the work should be suspended altogether, rather than he should be willing to incur the worry of being obliged to be continually borrowing to meet necessary expenses.

A NEW BLASTING POWDER.—Messrs. Schäffer and Budenberg propose a blasting powder consisting of 30 parts of nitrate of potash, 40 parts of nitrate of soda, 12 parts of sulphur, 8 parts of wood charcoal, 4 parts of common coal, and 6 parts of potassio-tartrate of soda. By this combination a combustible composition is said to be obtained particularly applicable to blasting purposes by giving increased effect with a slow and perfect combustion.

At the meeting of the Geological Society, on June 8th, Professor Maskelyne exhibited some specimens of a new mineral—a basic sulphate of copper—which he proposes to name "Langite," in honour of Professor von Lang, formerly of the mineralogy department of the British Museum.

Messrs. Grier and Boyd, of Pittsburg, Penn., the inventors of a new coal-digging machine, state that sufficient experiments have been made to establish the fact that one of these machines, with an engine of 15 or 20 H.P., could do the work of seventy or eighty men. The cost of the machine would be about $3,000, not including engines, pipes, &c.

The thousand tons of "South Leverson" gas-coal, the munificent gift of Mr. George Elliot, the large coal-owner, of London, and member of the firm of Glass and Elliot, to the New York Sanitary Fair, realised $13·50 per ton. The freight alone of this cargo was estimated at 1,000*l*.

We omitted last month to notice the death of Mr. John Garby, of Redruth, which took place on March 8th, at Cachias, in Brazil, while on a scientific excursion. Mr. Garby was well known as an excellent mineralogist, and was unequalled in his knowledge of Cornish minerals.

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APPLICATION FOR PATENTS FROM MAY 25TH TO JUNE 22ND.

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501 (652). G. H. F. ULRICH, Washing machines for the more effective extraction of fine gold, also the concentration of the auriferous pyrites and other useful ores contained in quartz lodes.
509 (660). B. TODD, Manufacture of antimony and the oxide of antimony.
511 (662). R. GOULDING, Extraction of gold, silver, and other metals from their ores and matrices.

AUSTRIA.

PATENTS DELIVERED, PROLONGED, AND BECOME VOID DURING MARCH.

107. J. ROSSIWALL and A. WENIGER, Improvements in refining iron and steel. [Delivered.]
121. G. A. HARDT, A sieve for ores. [Delivered.]
142. J. OSER, Improvements in the so-called "Krems quartz mill stones." [Delivered.]
103. A. RIEGEL, The manufacture of pressed mineral coal. [Prolonged.]
104. A. RIEGEL, The manufacture of pressed mineral coal. [Prolonged.]
105. A. RIEGEL, The manufacture of pressed mineral coal. [Prolonged.]
89. ROSTHORN, A process for preparing pure alumina at large, and for obtaining useful sub-products at the same time. [Become void].

BELGIUM.

PATENTS DELIVERED FROM JUNE 1ST TO JUNE 15TH.

16,168. P. LAGACHE, Manufacture of soda.
16,187. J. B. BOURIEZ, Improvements in conglomerating coal.
16,194. A. V. LABOULAIS, A direct mode of obtaining iron, steel, cast-iron, and other metals.
16,197. N. J. LEBRUN, A parachute of mines.
16,023. W. H. TOOTH, Manufacture of iron and steel.
16,222. T. HARRISON, Puddling iron and steel.
16,244. P. GANIDEL, A machine for conglomerating coal.
16,260. THE ESPERANCE COMPANY OF COAL MINES AND IRON WORKS, Improvements in washing coal.
16,271. M. EVRARD, A mode of treating minerals.
16,280. J. LETORET, Distilling coal.
16,282. L. PRAIRE, Conglomerating coal.
16,284. GUICHERD, jun., Smelting malleable pig iron.
16,285. J. BOWRON and G. ROBINSON, Manufacturing soda and sulphuric acid.

PRUSSIA.

PATENT CANCELLED IN APRIL.

1,665 (1857). J. H. F. PRILLWITZ, A machine for separating and washing coals and minerals.

UNITED STATES.

PATENTS ISSUED FROM MAY 3RD TO MAY 31ST.

42,669. R. H. LAMBORN, Improvement in coal mining apparatus.
42,671. S. LEWIS, Improvement in deodorising petroleum.
42,724. G. E. DONISTHORPE, W. FIRTH, and R. RIDLEY, Improvement in coal mining apparatus.
42,803. R. M. SMITH, Improved mode of utilising the waste acid from petroleum refiners.
42,844. A. H. EVERETT, Improved process of refining and softening lead.
42,869. M. NOWAK, Improved blasting compound.
42,898. W. CLELAND, Treating and utilising oxides of iron from gas purifiers.
42,899. W. H. DAWES, Manufacture of iron.
42,913. F. A. JAECKEL, Improved blasting powder.
42,947. J. HORNIG, Improved furnace for treating slag.
42,985. L. CHANDOR, Manufacture of sulphuric acid.
42,997. L. E. PRIVOT, Treatment of auriferous and argentiferous ores.

SPECIFICATIONS PUBLISHED, AND PRICES.

FROM MAY 21ST TO JUNE 18TH.

*** Specifications will be forwarded by post on receipt of price and postage at Her Majesty's Patent Office, 25, Southampton Buildings, London, W.C.—The amount of postage may be estimated from the price, as follows:—Where price does not exceed 1*s.* 6*d.*, postage will be 1*d.*; above 1*s.* 6*d.*, and not exceeding 3*s.* 4*d.*, it will be 2*d.*; above 3*s.* 4*d.*, and not exceeding 6*s.* 4*d.*, it will be 4*d.*—Sums exceeding 5*s.* must be remitted by P. O. O., on Holborn Office, payable to *Bennet Woodcroft.*

2,364 (1863). P. SPENCE, Obtaining sulpho-cyanide of ammonium; 4*d.*
2,398 (1863). G. ELLIOT, Props and supports for mines; 6*d.*
2,422 (1863). J. BOWRON, and G. ROBINSON, Manufacture of soda; 4*d.*
2,425 (1863). E. B. WILSON, Manufacture of iron and other metals; 10*d.*
2,459 (1863). J. GIBSON, Cast-iron pit tubbing; 6*d.*
2,477 (1863). G. PARRY, Refining iron; 10*d.*
2,483 (1863). R. A. BROOMAN (com. from H. W. ADAMS and W. S. WORTHINGTON), Separating gold and silver from quartz; 6*d.*
2,485 (1863). J. VAUGHAN, Purifying hydro-carbons; 4*d.*
2,502 (1863). C. HUMFREY, jun., Purifying waste gases from furnaces; 4*d.*
2,531 (1863). J. POLGLASE and J. COX, Apparatus for boring and cleaving stone; 1*s.* 2*d.*
2,550 (1863). F. DE WYLDE, Induration of stone and cement, and manufacture of artificial stone; 4*d.*
2,555 (1863). A BUDENBERG (com. from B. A. SCHAEFFER and C. F. BUDENBERG), Blasting powder; 4*d.*
2,558 (1863). W. CLARK (com. from J. J. BONNARD), Separating ores from their gangues; 6*d.*
2,571 (1863). W. A. DIXON, Manufacture of aluminate of soda; 4*d.*
2,583 (1863). G. HOWELL, Condensing metallic fumes; 1*s.* 4*d.*
2,600 (1863). J. MITCHELL, Sinking, quarrying and excavating; 4*d.*
2,624 (1863). E. S. CREASE, Drilling, boring or excavating; 8*d.*
2,630 (1863). W. LOCKE, J. WARRINGTON, W. E. CARRETT, W. E. MARSHALL, and J. TELFORD, Working and mining coal; 1*s.* 6*d.*

Current Review of Mining, Quarrying, and Metallurgy.

CORNWALL, DEVON, AND WEST SOMERSET.

Cornish mining still continues dull, and nothing has occurred during the past month worthy of special notice. There has been no alteration in the tin standard, and the copper standard, after fluctuating slightly, now stands about the same as last month.

In the case of *West Basset* and *South Frances*, judgment has been given in favour of the latter mine. Forty-three shares in *Trencrom* mine were sold in the Vice-Warden's Court at 1*l.* 10*s.* per share, subject to the calls and costs since July last.

Among note-worthy alterations in mines during the month—*Sithney Carnmeal* is said to be looking well, the lode in the 95 being reported worth 120*l.* per fm. The *West Briton* remarks that the reports from *East Lovell* are more than ever conflicting, but by far the majority given from correct samples and assays entirely disagree with those given from the source from which they should emanate. *Wheal Kitty* (Lelant) is reported to be looking well. At *Rosewall Hill and Ransom United* the lode in the sump winze below the 160 is looking well, worth 30*l.* per fm. The lode in the 130 west is 4′ to 5′ wide, and is said to be promising, being worth from 15*l.* to 20*l.* per fm. At *East Rosewarne*, King's shaft is improved, and is valued at 30*l.* per fm. The 75 is worth from 12*l.* to 18*l.* per fm.

At *Wheal Seton*, Tilly's shaft is worth 24 tons per fm.; the sump winze 18 tons; and other productive parts 51 tons per fm., making altogether 92 tons per fm. exclusive of the tin ground. At *Dolcoath*, the bottom of the mine is still poor, but the winze below the 266, within about 3 fms. of the 278, about 12 fms. east of the shaft, is still worth 40*l.* per fm. There are now 164 heads of stamps worked by steam, besides those by water power; but the falling off in the quality of the ores now raised demands increased returns to keep up the dividends. At *Cook's Kitchen* the engine shaft is sunk to the 258 fm. level, which will be commenced to drive under the winze sinking below the 246 fm., 6 fms. east of shaft, and down about 5 fms.; when this is holed it will lay open ground for stoping worth from 30*l.* to 35*l.* per fm. The 234 fm. level is driven upwards of 60 fms. east of engine shaft, and 6 fms. short of winze sinking under the 222 fm. level, which is down about 5 fms., worth 75*l.* to 80*l.* per fm. for 6 feet long: the end coming in under is worth about 40*l.* per fm. Dunkin's lode, which has been yielding a great deal of tin in Tincroft mine, is expected to be cut in this mine at the 210 fm. level during the next two months. At *Tresavean* an improvement is reported in the deepest level east, the lode turning out 5 tons per fm. *Wheal Agar* is reported to be looking very promising. It is said that the eastern part of *Carn Brea* is to be worked more vigorously, and 48 additional heads of stamps are to be erected. At *Great South Tolgus* in the 112 cross-cut the agent thinks they are near the lode, as there are good stones of ore in the cross-course. The lode is also said to have been seen in the 154. At *East Carn Brea*, a new lode has been cut in the 26, the ends on which are reported worth over 8 tons of good ore per fathom. On the south lode the 30 east is worth 3 tons, and the 30 west 1½ tons. The 60 west has improved to 4 tons per fm. *Pednandrea* is said to have improved going eastward. The 130 east is looking promising and approaching the tin ground gone down below the 120. At *East Grenville*, the 68 west still continues driving in a good course of ore, worth 50*l.* per fm. At *Wheal Crofty* a lode is said to have been cut in the 55 fm. level, driving north, about 18″ wide, producing good stones of copper ore and of a very promising appearance. There is also a good branch of copper ore in the 24 fm. level, west of the cross

course, from 3″ to 4″ wide. *South Crofty* has lately improved, James's shaft being worth 25*l.* per fm.; 120 east of this shaft, 5′ wide, 22*l.* per fm.; and 120 east, 23*l.* per fm.

At *Wheal Rose*, there has been an improvement in the 70 east, going towards Hallenbeagle. At *Great North Downs* the lode in River shaft, close to Wheal Rose boundary, is reported worth 50*l.* per fm. At *Hallenbeagle*, there is a kindly lode in the eastern whim shaft. At *Nanjiles* the sump shaft is still said to be poor. At *Great Wheal Busy* a good discovery is reported in the 130 east of Offord's, the lode being 2½′ wide, with fine rocks of tin, and all in whole ground.

Among improvements in lead mines, at *North Shepherds* the lode in the adit end east is reported to be improved. At *Cargoll*, Michell's engine-shaft is said to be looking much better, and there is a good lode coming in in the north end; the stopes in the back of the 110 are productive, and the killas in the new shaft is said to be encouraging. At *Wheal Chiverton*, the 40 east of Cookney's and west of Murray's shafts is progressing favourably. At *West Chiverton*, the 80 west of Hawke's is worth 100*l.* per fm. and the 80 east worth 10*l.* per fm. Valpy's lode in the 80 east of the cross-cut is worth 70*l.* per fm. and in the 80 west worth 20*l.* per fm.

As to Eastern mines, *East Caradon* is said to be looking better, particularly in the 80 east. At *Marke Valley*, Marke's lode has been intersected in the 100 cross-cut, 6′ wide, and is reported worth 3 tons of ore per fm. At *South Caradon Wheal Hooper* it is reported that in the 54 cross-cut south a lode has been cut 18″ wide, producing good stones of copper ore.

Among transactions at mine meetings we may note:—At *East Basset* meeting (on May 31st), Mr. F. W. Dabb was unanimously elected purser; and at *Wheal Basset* meeting, he was also unanimously recommended as purser, and Capt. Pope as manager. At *Condurrow* meeting (on June 1st) the banking account was transferred from the Miners' bank to the West Cornwall bank; the account has been very heavily overdrawn. At *Retanna Hill* meeting (on June 6th) it was resolved that the mine be subdivided into 512 shares. At *Grambler and St. Aubyn* special meeting (on June 8th), Mr. F. W. Dabb was appointed purser in the place of the late Capt. Richards; and at *South Basset* meeting (on June 14th) he was also appointed purser. At *West Great Work* meeting (on June 14th) 351 shares were declared forfeited for non-payment of calls. At *Wendron United* account (on June 15th), a resolution was passed (subject to confirmation on the 29th, on which day a special meeting was to be held) to offer the mine by public auction in one lot. At *North Downs* meeting (on June 22nd) after some discussion a resolution was passed to the effect that it was desirable that Wheal Peever should be divided from North Downs and worked as a separate mine, and that the manager and secretary be requested to prepare a plan prior to the holding of a special general meeting to be convened for the purpose of taking the matter into consideration. In consequence of the extraordinary number of inspections of *East Grenville*, and the great hindrance thus caused to the working of the mine, the committee have resolved, in future, to set apart one day (Friday) in the week for public inspections.

Among the new companies brought out during the month have been:—*South Lovell* mine is to be worked by a cost-book company in 2,000 shares, at 2*l.* each. It adjoins East Lovell, and has been favourably reported upon. *Lovell Consols* mine, west of Old Wheal Lovell, is also to be worked by a cost-book company in 3,000 shares, of which 2,000 are offered at 2*l.* each. *Great North Vor Tin and Copper* Mining Company (Limited), with a capital of 25,000*l.*, in 5,000 shares of 5*l.* each, has been formed for the purpose of purchasing and working the setts formerly known as Leedstown Consols and Polglase. *East Wheal Florence*, near Callington, is to be

worked by a cost-book company, in 6,000 shares, of which 4,000 at least are to be considered the property of the original adventurers, the remaining portion being offered to the public at 2*l.* per share.

WALES AND THE BORDERS.

South Wales.—There appears to have been for a few weeks past a lull in the iron trade, though towards the end of the month the market showed a more favourable tendency. Buyers have been holding back a little, in hopes of a reduction in prices, which, however, does not seem very likely to take place. There has been very little doing at the tin-plate works, this branch of the trade having suffered greatly in consequence of the new American tariff. The next quarterly meeting of the Staffordshire makers is looked forward to with great interest, and opinions seem to be about equally divided as to whether present list rates will be maintained or not. Unquestionably a critical juncture has arrived, for the high wages paid to the men will not permit the makers to consent to anything like a considerable reduction; and, on the other hand, how are the wages to be reduced when there is a positive scarcity of hands at several of the principal works.

It is said that another furnace has been blown in by the Ebbw Vale Company at *Victoria*, and also one at *Hirwain*. The *New Vernon* Tinworks, Briton Ferry, the property of Messrs. Smith, Morris, and Co., have lately been opened, and the new tin-plate establishment at *Melyncryddan* is now in full work. The *Melin* works at Neath have also been just started. A large quantity of iron ore is being turned out at the *Llantrissant* mines.

The coal trade has been steady, with a large demand for abroad, which there has been some difficulty in meeting. The advance of 1*s.* per ton is easily maintained, and the men are receiving very high wages. Since the re-opening of the West Bute Dock, the steam-coal trade has resumed its usual activity, and the collieries in the *Rhondda* and *Aberdare* valleys are working full time. Several open air meetings of the colliers have recently taken place, with the view, if possible, of keeping up the agitation for a further increase in wages, but the great majority of the men have kept aloof from the movement, and seem well satisfied with the wages received, and they are working more regularly than has been the case for a long time. There is also no lack of work; on the contrary, vessels are often waiting for cargoes, owing to the insufficient supply from the collieries.

The emigration from South Wales is again becoming very general, and a large number of men employed at the iron and coal works leave at nearly every pay. It was believed that the successive advances granted in the wages of the men would have checked the movement to some extent, but this has not been the case, and there is every reason to believe that more will leave this year than last.

It is stated that Mr. George Elliot, the extensive colliery proprietor of Newcastle, and a partner in the well-known firm of Glass, Elliot, and Co., is in treaty for the purchase of Messrs. Powell and Sons' steam-coal collieries, which include the Middle and Lower Duffryn, Abernantygroes, Plough, Cwmpennar, Cwmdare, and New Tredegar Collieries, but not the house-coal collieries. The *Ely Merthyr* Colliery Company have so far developed their colliery at Gellygron that they will commence to ship coal in a few weeks. The *Venalt* Company are also making the necessary arrangements to complete their sidings to the railway from the property, and to carry out other works.

The number of vessels engaged in the export trade of Cardiff during the month of May was 283, against 328 in the corresponding month of last year, and the quantity of coal exported reached 106,966 tons, against

98,391 tons in the same period of last year. As compared with the previous month, however, there was a *decrease* of nearly 24,000 tons, which is accounted for from the fact that the West Dock was closed for repairs. 564 vessels were engaged in the coasting trade, and the total shipments amounted to 73,633 tons, being a slight *increase* on the previous month. 3,684 tons of patent fuel were exported, principally to eastern ports.

An explosion occurred on June 1st, at the *Cwm Glyn* colliery, Pontypool, by which one man was killed, and several others were seriously injured. It was caused by the air-door having been left open, which allowed the gas to accumulate.

During the month of May 57 vessels were engaged in the foreign trade of *Newport*, and 542 in the coasting. 16,433 tons of coal were exported foreign against 12,112 tons in the corresponding month of last year, and 57,548 tons coastwise, being an increase of nearly 8,000 tons as compared with the previous month. A total of 576 ships were engaged in the trade of *Swansea*, with an aggregate registered tonnage of 66,268 tons, and the shipping rates received amounted to 1,619*l.* 15*s.* 7*d.*, showing an *increase* on the corresponding month of nearly 10,000 tons in tonnage, and 300*l.* in shipping rates. 44,381 tons of coal were exported foreign, and 26,427 tons coastwise, being a large *increase* on both the previous and corresponding months. The five months of the present year show an *increase* over the same period in 1863 of 286 vessels and 44,891 tons tonnage. *Neath* and *Briton Ferry* exported 29,520 tons of coal, coke, and culm, 1,208 tons of bar iron, 387 tons of tin plates, 160 tons of copper, making a total of 31,275 tons. The imports were 8,659 tons of iron ore, 3,666 tons of pig-iron, and 2,608 tons of copper ore. The exports showed an *increase* of 3,198 tons over May, 1863, and the imports 4,567 tons. *Llanelly* exported 15,255 tons of coal foreign, and the shipments coastwise reached 25,810 tons.

The arrivals into Swansea include:—510 tons of pig-iron from Antwerp and 140 tons from Brussels; 1,035 tons of iron ore from Cherbourg, 345 tons from Bilbao, and 580 tons from Santander; 1,160 tons of copper ore, 1,320 tons of copper regulus, 33 tons of unwrought copper, and 381 tons of silver ore from Caldera; copper ore from Seville, Aveiro, Carisal Bajo, Guayacan, Almeiro, Castil Deferro, Coquimbo, Carigal, Hondeklip Bay, and Cuba; copper regulus from Cuba, Carisal Bajo, and Pena Blanca; 192 tons of zinc ore from St. Malo, 810 tons of nickel ore from Kragero, and 155 tons of silver ore from Alicante.

GLOUCESTERSHIRE.—Among the imports into Bristol have been:—899 tons of sulphur ore and 265 tons of pyrites from Arklow, 143 barrels of sulphur, 5 tons of pig iron, and some lead ore from Liverpool; 100 tons of silver-lead ore from Plymouth, 60 tons from Newquay, 100 tons from Truro, and 60 tons from Aberystwith; and 150 tons of sulphur ore from Pomaron. During the month of May, 712 tons of coal and 1,310 tons of iron were exported oversea from Bristol, as against 1,410 tons of coal and 810 tons of iron shipped in the preceding month, showing a *decrease* of 698 tons in the exports of coal, but an *increase* of 500 tons in the exports of iron. Compared with the corresponding month last year, when 794 tons of coal and 2,492 tons of iron were exported from Bristol, the above returns show a *decrease* in the shipments of 82 tons of coal and 1,182 tons of iron.

The imports into Gloucester include:—216 tons of pig-iron from Ardrossan, and 27 tons from Cork; 110 tons of iron from Briton Ferry, 95 tons of sulphur from Pomaron, 100 tons of coal from Milford, and 35 tons from Saundersfoot. The exports comprise:—265 tons of iron, 133 tons of burnt ore, and 253 tons of coal.

NORTH WALES.—A new company has been incorporated, called the *Pant-y-Buarth and United Lead Mining* Company, with a capital of

100,000*l.*, in 10,000 shares of 10*l.* each. It has been formed for the purpose of purchasing and working the Pant-y-Buarth United Mines, situated about three miles north-west of Mold, Flintshire. The *Caedryn Slate Quarry* Company, with a capital of 50,000*l.*, in shares of 10*l.* each, has also been announced, the object being to work a quarry 4¾ miles from the River Conway, with which it is connected by a tramway. The *Pennant Slate* Company has also been formed for the purpose of working the Pennant Slate Quarry, about six miles from Portmadoc, Carnarvonshire. The capital is 50,000*l.* in 10,000 shares of 5*l.* each.

MIDLAND COUNTIES, SOUTH LANCASHIRE, AND SOUTH YORKSHIRE.

STAFFORDSHIRE AND WARWICKSHIRE.—The iron trade has been very quiet, and several more furnaces have been put out of blast. It was at first thought that the advance in the American tariff would have no unfavourable effect upon the trade with that country, but since several orders from American houses have been lately countermanded, it is feared that the tariff will be continued after the time specified, and this will put a check upon any very active business with America. On June 1st, a meeting of coal and iron masters was held at *Wolverhampton* to consider the question of the wages paid to the miners in South Staffordshire. It was shown that at the low prices of pig-iron and the comparatively prostrate condition of the market in that description of iron, the metal cannot be made at a profit by the makers who are of all others the most favourably circumstanced relative to their mines and the quality of material they yield. Upon the rest it was declared that the process entailed a decided loss. It was, therefore, unanimously resolved that notice should be given to all the men for a reduction of 3*d.* a day; namely, from 3*s.* 3*d.* to 3*s.* To the men in the Bradley district—some 2,500 or 3,000 in number, who have recently been on strike against a reduction of from 3*s.* 6*d.* to 3*s.* 3*d.*—the reduction would be at the rate of 6*d.* a-day. A proportionate reduction, it was understood, would at the same time be made in the wages of the men employed about the blast-furnaces.

The coal trade has been very slack, and prices quite nominal. At a meeting of coal masters held on June 15th, at *Dudley Port*, it was resolved to reduce the wages of thick and thin colliers 6*d.* per day after the close of that month when the prices of coal and slack would also be reduced. A large open-air meeting of colliers has been held in the Dudley district, and there were delegates present from Scotland, Leeds, and other places. The following resolution was passed:—"That the Union of this district approve of the objects of the Miners' National Association, and pledge themselves to support its operations and contribute to its funds."

The *Hednesford Colliery* Company, with a capital of 60,000*l.*, has been formed for the purpose of working mines near Cannock, which have, up to the present time, been worked by Messrs. Francis Pigott and Co.

SOUTH YORKSHIRE.—Great activity has marked the iron trade for some time past, notwithstanding the numerous strikes and lock outs. Some of the men at the *Bowling* Works have signed the declaration and resumed work, but the greater part still hold out. Many of the furnaces are standing idle, and the men are supported by the Union.

Many of the collieries are doing a good business, there being a ready sale. As most of the colliers are on strike, the pits have to be worked by men from a distance, which has caused great excitement among those on strike, and much inconvenience and loss to the masters.

An explosion occurred at *Victoria* Colliery, near Pontefract, on June 9th, which resulted in the death of two men.

DERBYSHIRE.—Both the coal and iron trades continue in a very satisfactory state; the men who, at this time last year, were not working more than four or five days at a time, are now fully employed and receiving first-class wages. The lead mines in this district are also going on well. An accident occurred recently at *Clay Cross* from an explosion of gas, causing the death of two men.

SOUTH LANCASHIRE.—The coal trade has shown great briskness during the past month considering the time of year, particularly in house-coal. There has also been a moderate amount of activity in the iron trade.

NORTHERN COUNTIES, NORTH LANCASHIRE, AND NORTH YORKSHIRE.

NORTHUMBERLAND AND DURHAM.—The iron trade has, on the whole, been fairly active, though in the Cleveland district it has been rather unfavourably influenced by the aspect of political affairs, still there has been a good demand for all kinds of iron, and prices have been pretty well maintained. Excepting at *Consett*, there are no furnaces out of blast between the Tyne and the southern boundary of Cleveland. For above a month sixty-three furnaces have been in full operation, and for a considerable period previous to that only one furnace was out of blast, it being under repair. There is some hope that even at Consett employment may be found for some of the idle furnaces.

A sale by one firm of 24,000 tons of pig has been, it is reported, recently concluded at good prices. Two or three transactions of the same extent would, in some measure, counteract the evils now operating prejudicially on the trade. It is said that the quality of the Cleveland iron is likely to be greatly improved by the admixture of titanium and manganese ores with the ironstone of the district.

It is stated that one of the largest ironworks and foundries in the North of England, situated in *Gateshead*, is shortly to be merged into a limited liability company, as the present principal partner intends retiring from business. At the *Skerne* Ironworks, belonging to Messrs. Pease, Hutchinson, and Ledward, about 200 hands are employed in manufacturing ship and boiler-plates. The *Hartlepool* Rolling Mills Company will, it is said, be in working order by the beginning of October, and rapid progress is also being made in the erection of the rolling mills at *West Hartlepool*.

The members of the local Pitmen's Union, better known as the Northumberland and Durham Miners' Mutual Confident Association, held their annual meeting in Newcastle on the 3rd and 4th of June. The chief business before the meeting was a proposition from the Northumberland members to divide the Union into two branches—one for Northumberland and one for Durham, but no decision was come to.

The coal trade of this district appears to be in a most satisfactory condition, and a steady business has been done throughout the month. The recent Admiralty instructions have quickened the demand for steam-coal, and all the collieries which yield that class of coal are doing good work. The demand for coke is also greatly on the increase, many of the coking collieries being unable to accept all the orders which they receive, and very high prices have been obtained.

Old collieries are being greatly extended. *Towneley* Colliery, the property of Mr. T. Y. Hall and partners, is being laid out for a very large trade. A colliery near *Newcastle* has done scarcely anything but contract work for the last five or six years, and just now the owners are receiving no end of orders and inquiries about guaranteeing supplies for one, two, or three years. To such an extent has the demand gone, that they are

putting down new shafts for the purpose of meeting it, and by Christmas, and perhaps earlier, they will have five or six pits in operation instead of one. The sale of collieries which took place a few weeks back at *Newcastle*, showed great confidence in the future of the coal trade, for very good prices were given, and information has come to hand that the West Hartlepool Harbour and Railway Company have disposed of the *Merrington* and *Page Bank* Collieries—the first to the owners of Whitworth Colliery, and the other to Messrs. Bell Brothers, the well-known ironmasters.

Messrs. Ridley and Co's. coal-cutting machine, which has been in use for some time in *Broomhill* Colliery, is said to give great satisfaction. It is also in use at *Hetton* Colliery, and should it continue to be successful, it will probably be introduced into other hard-coal collieries in this district.

SCOTLAND.

There has been a limited demand for coal for home use during the past month, with a fair request for export.

The iron trade has for the last few weeks shown a decidedly downward tendency, and about the middle of the month first-class makers reduced the price of bar-iron 10*s.* per ton, which has seemed only to produce more caution on the part of buyers. Second-rate makers have also accepted lower rates. The puddlers' strike at *Dundyvan* has now been going on for more than four months, and there seems at present no prospect of the men giving in, their demands being an advance of 6*d.* per ton. They state that they have been working much under the rate of many works that surround them; their pay is monthly and there is a store, where they have to spend all their wages. They now demand to be paid every fourteen days, and the privilege of spending their money where they will. The manager conceded the 6*d.* per ton of advance in the third week of the strike, but he still resists the demand for fortnightly pays. It is rumoured that the works are to be commenced by strangers from a great distance. The puddlers have now been joined by the millmen in the turn-out.

The shipments of pig-iron down to the end of May were as follows:—

Month.	1864.	1863.	1862.	1861.
	Tons.	Tons.	Tons.	Tons.
January	38,476	30,467	44,729	39,267
February	45,843	38,807	39,614	33,070
March	61,525	50,909	44,495	33,474
April	76,176	70,995	66,975	77,356
May 7	17,982	16,329	14,127	16,045
„ 14	15,501	12,360	14,121	18,110
„ 21	16,599	14,444	13,972	16,748
„ 28	14,616	11,037	14,426	16,399
Totals	286,718	245,409	252,459	250,466

Thus the shipments effected in May, 1864, amounted to 64,698 tons against 54,170 tons in May, 1863, 56,646 tons in May, 1862, and 67,302 tons in May, 1861. It will be observed that the shipments in the first four months of 1864 were 41,309 tons in excess of those effected in the corresponding period of 1863, 34,259 tons in excess of those effected in the corresponding period of 1862, and 36,249 tons in excess of those effected in the corresponding period of 1861.

A valuable discovery is reported to have been made on the property of Mr. William Forlong, at *Erins, Lochfyne*, which has been carefully explored

by Mr. J. Cowsell, of Manchester, who, on May 9th, discovered a vein of galena or deep blue flucan; it has since been opened up, and is found to be 9′ wide, and traceable for one and a half miles.

CONTINENT OF EUROPE AND MEDITERRANEAN COUNTRIES.

FRANCE.—The iron trade of *St. Dizier* has been almost stationary for some time past, and there seems little prospect of a more favourable state of affairs. The re-organised committee of French iron masters has lately held its quarterly meeting, and the position of the trade is summed up as follows:—"The committee observe that on the whole the state of affairs has not improved, as there was reason to hope would be the case. In the southern group alone a certain amelioration is observable, but in the Paris market there is a tendency to a fall."

The following statistics show the position of the French coal and iron trades during the first quarter of 1864. It appears that the receipts of rough and worked pig during the first three months of this year, were 13,986 tons, against 51,249 tons in the corresponding period of 1863; of iron bars and rails, 318 tons, against 5,150 tons in 1863; of plates, sheets, &c., 404 tons, against 1,731 tons in 1863; of steel of all kinds, 420 tons, against 508 tons in 1863; of coal 1,226,473 tons, against 1,114,736 tons in 1863; and of coke, 158,907 tons, against 186,311 tons in 1863. The imports of pig and iron have, as was to be anticipated, considerably declined this year, in consequence of the low quotations which have prevailed in the French market, and of the rise in the two principal exporting countries. A large proportion of the decrease which the exports to France in the first quarter of 1864 present, as compared with the corresponding three months of 1863, arises from the diminished imports of British iron to France. Thus the reduction in the value of the imports of all kinds of iron in the first three months of 1864, as compared with 1863, was 67,441*l.*

It is stated that the works of the *Douvrin La Bassée* coal mines are about to be resumed. They are situated within almost half-a-mile of the Aire Canal, and the prospects of the concern will become still better on the completion of a new railway from Lille *viâ* La Bassée, which will pass through the concession. Of all the collieries of the Pas-de-Calais, that of Douvrin will thus be the nearest by railway and canal to Lille, which is a very important centre of consumption. Exploratory works are about to be prosecuted in the Pas-de-Calais basin between the *Hardinghem* Colliery and that of the *Lys-Inférieure*, near Thérouanne, and they are said to present good chances of success. In the Nord, the *Crespin* mines, near Condé, are about to be again worked. A company has been formed for working coal mines near *Annecy*, in Savoy; and another company, has obtained a colliery concession in the Sarthe. An important exploratory society is also in course of formation, with the view of prosecuting researches in the centre of the coal basin of the Nord. In the Pas-de-Calais coal basin, the *Ferfay and Ames* Company, near Villers, has cut in its second pit two seams of rich coal.

BELGIUM.—At Charleroi the state of the iron trade has been good, a great many orders having been received from England, and a good demand for rolled iron is expected from Russia. It is stated that some capitalists of the Charleroi basin are negociating for the purchase of the *Pommereul* blast furnaces, which have been idle for some years past. The proprietors of the *Ougrée* works have been authorised to extend them in various ways, and also to introduce six steam engines of three, six, eight, fifteen, and fifty horse power respectively.

The official returns published show that the imports and exports of

iron, steel, &c., into and from Belgium during the first four months of 1864, have been as follows:—

	1864.	1863.	1862.
	Tons.	Tons.	Tons.
Unworked steel	861	633	603
Iron ores	56,519	56,928	28,314
Rough pig and old iron	1,782	1,947	710
Rails	—	1	—
Plates	2	16	2
Other iron	379	248	324
Worked pig	38	33	23

The chief feature in these figures is the large increase observable in the imports of ores into Belgium. The exports have been as follows:—

	1864.	1863.	1862.
	Tons.	Tons.	Tons.
Unworked steel	25	44	22
Iron ores	55,635	76,746	66,858
Rough pig and old iron	9,792	10,643	12,484
Rails	18,797	14,149	8,439
Plates	5,112	2,555	2,556
Other iron	16,720	10,174	5,397
Worked pig	1,329	129	334

There is not much improvement to notice with regard to the coal trade; the positions of the various basins show no change. Several Belgian collieries have concluded some important contracts with iron-masters. Thus the *Bonne Esperance* Colliery has engaged to supply sixty tons per day to Messrs. de Dorlodot, and the *Poirier* Colliery is also to deliver 100 tons per day to the same firm.

From official reports it seems that during the present year the imports of coal into Belgium have amounted to 22,527 tons against 26,286 tons in the corresponding period of 1863. In the exports there has been very little change as compared with 1863.

SAXONY.—A new undertaking is announced called the *Anglo-Saxon United Tin Mining and Smelting* Company, with a capital of 150,000*l.*, in shares of 2*l.* each, formed for the purpose of working the Ehrenfriedersdorf, Sauberg, and Freiwald Mines, situated near Chemnitz, and producing tin and arsenic. The prospectus states that the mines cover an area of about 1,104 squares acres, and are to be acquired for 43,500*l.*, one-third of which will be taken in paid-up shares of the company. The royalty is redeemed to 1870, after which the payment to the Government is fixed at 2½% (equal to 1-40th dues) on the returns of the mines. The former proprietors lodged in the hands of the Saxon Government a deposit of 1,500*l.*, on which the company will receive 4% from the time they commence working. The mines are near to the Annaberg and Chemnitz Railway, and there is water available equal to 100 horse-power.

NORWAY.—The property now in the hands of the liquidators of the *East Kongsberg Native Silver* Mining Company is proposed to be purchased by a new company, with a capital of 150,000*l.*

PORTUGAL.—The annual general meeting of the *Portugal Iron and*

Coal Company was held in London on June 28th, when it was stated that the quantity of iron ore raised, up to June 4th, was 2,497 tons, but the extraction of ore was purposely limited until the furnaces were finished. The quantity of lignite appeared to be inexhaustible. According to an analysis made by Professor Herapath, this lignite contained more than 90% of carbon, and was perfectly free from phosphorus and sulphur, so that it was specially adapted for smelting purposes.

ITALY.—Some interesting statistics on the production of sulphur have been published in the *Moniteur Scientifique*. The annual yield is about 300,000 tons, valued at 1,200,000 francs. The greater part of this is obtained from gypsum beds in Sicily, and also from limestones and clays. The method of extracting the sulphur from the calcareous gangue has been lately much improved. It is always obtained by liquefaction, and the operation, formerly performed in small furnaces, is now effected by simply heaping the stones and covering them with earth, as in charcoal-burning. This method diminishes the former losses occasioned by the production of sulphuric acid, so that the yield of sulphur is increased one-fifth.

The *Vallanzasca Gold* Mining Company have received advices, dated Pallanza, June 17th. The lode continues to yield good ore, but a great improvement is expected there in driving further on. The lode in the Sasso Nero, at the bottom, is reported rich, yielding ore containing more than 5 oz. of gold per ton.

NORTH AMERICA.

NOVA SCOTIA.—An American paper states that the new board of Directors of the *New York and Nova Scotia Gold* Company have decided to sell a large portion of their mining interest to a new company—the *Brooklyn and Tangier Gold* Company. It is expected that the proceeds of the sale will put the New York and Nova Scotia Gold Company upon a safe and firm basis, giving it possession (it is asserted) of all means wanted to make it a dividend paying institution.

LAKE SUPERIOR REGION — Mining matters at *Keweenaw Point* are reported to be going on satisfactorily. At *Etna* Mine, the shaft on Sullivan vein is producing large quantities of ore, and the mine altogether is looking very well. At *Girard*, the Star vein is turning out large quantities of good quality ore. At the *Philadelphia and Boston*, the *Empire*, the *Vulcan*, and the *Resolute* mines, operations are being pushed forward as actively as possible, but as yet they have done nothing more than surface work. The Lake Superior iron trade is also being successfully pushed on. The *New England Iron* Mining Company have commenced operations on their property to the south-west of the Lake Superior Mine near the Marquette and Ontanagon extension. A new blast-furnace is to be erected at *Esconaba*, the ore for which can be delivered at the furnace. It is to be fed with bituminous coal.

The directors of the *Bohemian* Mining Company of Ontanagon have published their annual report, from which it appears that the progress of the operations during the last year has been on the whole satisfactory. Among other improvements, a saw-mill and stamp-mill of twelve heads with engines for each have been purchased and put to work. The quantity of ore shipped was 47,088 lbs., of which a portion was smelted at the new works at Ontanagon, and the remainder at the Detroit Works. The Ontanagon Works were unfortunate in their furnaces, and most of the copper sent to them was unavailable till late in the season, and then at a loss as to the quantity of ingot. Owing to the scarcity of men and the high rate of wages, the progress made has not been so great as was anticipated, but this defect they hope to remedy very shortly.

The *Cleveland Iron* Company, whose mines are near Marquette, have declared two dividends of $5 per share each since January last; the last one being out of the proceeds of the sale of part of their property to a new company.

As an example of the progress of copper mining at Lake Superior within a few years, it may be mentioned that the stock of the *Minesota* and *Pittsburg and Boston* are now worth about twenty times their original value. In two years and nine months the stock of the *Quincy* had advanced from $20½ to $96½; the *Pewabic*, from $18 to $67½; the *Franklin*, from $10 to $60; and the *Portage*, from $2½ to $46; or an average advance of over 360%. During 1863, the working copper mines of Lake Superior produced $6,000,000 worth of metal, fully equal to the capital invested.

From the annual report of the *Central* Copper Mine it appears that the quantity of copper raised and prepared for shipment during 1863 was over 400 tons. The report states that the mine generally looks well, and there is a large quantity of copper in sight which will be made available as soon as the incline shaft, now being sunk, is completed.

UNITED (ATLANTIC) STATES.—Large discoveries of zinc have been made on the property of the *Keystone Zinc* Company in Sinking Valley, Pennsylvania. It is said that most of the lands on which these discoveries have been made are manor lands once belonging to William Penn, who reserved to his heirs the right to the minerals found thereon, and it is expected that this will give rise to litigation.

It is reported that a discovery has been made of some promising oil territory, on *Dunkard Creek*, in Green County, Pennsylvania. Five wells have been bored, of which three have yielded oil in considerable quantities, and it is expected that these deposits will soon attract a large portion of public attention.

Ground has been broken near St. Clair for a shaft to reach a new level in the *Pine Forest* Colliery. The wet weather has been very damaging to the collieries, many of the most important ones having been "drowned out." An American paper gives some particulars of a mining case which was then going through the *Pottsville* Courts. "It seems that the *Pioneer* and *Tunnel* Collieries, in Ashland, are connected in the lowest level by a 6′ drill hole, bored through the intervening pillar of coal, for the purpose of allowing the water accumulating in the Tunnel Colliery to flow into the Pioneer Colliery, whence it is taken to the surface by a large Cornish pumping engine, which was intended to drain both mines. This engine was erected by the owners of the estate on which both of the collieries are situated. The operators of the Pioneer Colliery finding the water to be gaining on the pump, shut it off in part, by inserting a plug in the drill hole. The Tunnel Colliery immediately began to fill, and suit was brought by the lessees to compel the removal of the plug. The decision of the Court in the case will be based partly on the covenants in the leases, in regard to the management of the water, and partly upon the evidence given as to the actual capacity of the pumping engine, and as to the increase of the drainage since the engine was put in. To make this evidence as complete as possible, the case has been referred to a Mining Engineer and a Machinist, who are to examine the mine and test the engine. The test of the engine will be carefully made, and the report will be of very general interest, as the subject is important to all persons engaged in mining. Every year increases the liability of our deeper mines to the dangers of inundation, and the importance of securing the best machinery for their protection makes itself felt more sensibly. The Cornish engine is securing a recognition of its merits here as well as in England, and we are confident that it has nothing to fear from a careful scrutiny of its performance."

The *Pennslyvania Coal* Company has declared a dividend of 7½%, making 22½% since January.

CALIFORNIA AND BORDER TERRITORIES. — The *San Francisco Mining and Scientific Press* states that great sensation has been produced in California and the neighbouring territories by the proposition before Congress to levy a tax of 5% on the gross yield of all mines of gold, silver, and quicksilver. The most strenuous efforts have been made by the Californian delegation, but their efforts appear to have been unsuccessful.

Reports from the *Washoe* district state that a vein or bed of plumbago has been struck in the Kentucky tunnel, near American Flat, and a company has been formed for working it, called the *Scott and Bergen Plumbago* Mining Company. There is also another deposit of this mineral near the Ophir Grade, a few miles east of Washoe City, where at one time fire-proof bricks were manufactured from it. Some extraordinarily rich rock has been lately taken from *La Mina De La Alto* lead, which, when assayed, showed $735·90 of silver and $649·35 of gold per ton, making its total value per ton $1,385·25. This mine is situated near the summit of Mount Ophir. A new mill is to be erected near the Pioneer Foundry, on the road to *Silver City*, which was expected to be in operation by the middle of July. Several other mills are also to be erected; and altogether mining operations are being very vigorously prosecuted in all parts of the Washoe district. From $25,000 to $30,000 worth of bullion is daily shipped from Virginia City by Wells, Fargo, and Co.

No discoveries of any particular importance have been reported from the *Reese River* mines since our last. In the Austin Canon a good deal of enterprise is being displayed, and several mills are in course of erection on Big Creek, both for steam and water power. Levellings are about to be erected in Geneva Valley.

From the *Humboldt* mines it is stated that another rich lode has been met with in *Sheba*, and good ore is being obtained from several other mines. It is reported that a very rich copper lode has been discovered at Sawyer's Bar, on Salmon river.

A salt mine has been discovered, on the east side of the Noyo Range, *Owens River*, which covers an area of 1½ miles in length by ¾ wide. The salt is in a perfectly crystallised form. The locality where it is found is called Saline Valley.

Good specimens of coal continue to be received from various localities in *Nevada Territory*, and it is hoped that many of the mines now being worked may prove of permanent value.

It is said that a valuable quicksilver mine has been accidently discovered near *French Corral*, in Nevada County. The vein is reported to be very rich, yielding over 95% of the pure metal.

As illustrative of the cost of working mines it may be mentioned that the *Gould and Curry* Company took out of their mine in a month over half a million of dollars (100,000*l.*), of which $150,000 (30,000*l.*) was paid in a dividend, the balance going for working the mine. This company are making extensive improvements at their big mill; the foundations for the engine and other machinery are of massive granite.

SOUTH AMERICA.

GRANADA.—The *Mariquita and New Granada* Mining Company have received advices, of which the following is an abstract:—Santa Ana Mines —For the month of January: cost $14,112, returns $13,140. Owing to the pump getting out of order it was impossible to raise the usual amount of ore. Captain Redington writes that in June they hoped to have the new shaft completed to 110 fms.

BRAZIL.—The annual report of the directors of the *St. John Del Rey* Mining Company states that the net profit on the working of the mines from 23rd March, 1863, to 22nd March, 1864, has been 63,285*l.* 11*s.* 4*d.* The balance of interest on funds in hand that has accrued during the year has been 528*l.* 4*s.* 4*d.* These amounts, being carried to the credit of the profit and loss account, leave that account in credit, after paying the half-yearly dividend, due on the 25th December last, the sum of 27,765*l.* 13*s.* 7*d.*; out of which the directors have now to propose a dividend of 2*l.* 10*s.* per share, free of income tax, amounting to 27,500*l.*; leaving to the credit of profit and loss 265*l.* 13*s.* 7*d.*

The directors of the *East Del Rey* Mining Company have received advices from their superintendent, Captain William Treloar, dated Sabara, May 13th, which state that the Papa Farinha watercourse, including the tunnel, launders, stands, &c., was nearly finished. The sinking of Henderson's shaft was progressing favourably; lode small, but producing some good work for the stamps. In extending eastward of stull No. 1, the lode continues to enlarge, and presents a promising appearance. The Hard lode continues to improve, and looks better as it is more gone into. At Morro Sao Vicente, considering the few Europeans labourers there, excellent progress had been made in the alterations and repairs necessary to the old pumping machinery.

The *Santa Barbara Gold* Mining Company have received the following advices from Captain Bryant, dated Pari, May 14th. Reduction Department: stamped since April 20th, from bottom shaft and adit level, twenty days to May 10th, 246 tons; previously 301 tons; total to May 10th, 547 tons.

The directors of the *Rossa Grande Gold* Mining Company have appointed Captain Brokenshar, late chief superintendent at the Mines of Gongo Soco, as their chief mining engineer, and he, together with a staff of workmen, will proceed to Brazil during the month of July, to take possession of the company's mines.

A new company has been started called the *New Del Rey Gold* Mining Company, which has for its object the purchase of the Taquichil Mines, situated about four miles from St. John Del Rey.

CHILI.—The *Copiapo* Mining Company have received the following reports from their agents, dated May 15th. In the winze at the 65 fm. level east of Price's shaft there is a good lode of ore. The lode in the end driving west at the 50 fm. level east of Price's shaft is still improving, and producing a little ore of 12 °/₀. In the 70 driving west the lode is 2′ wide, and looking very promising.

CUBA.—The *Cobre* Mining Association have just received advices which state that the new lode in the 48 fm. level driving to intersect the great north lode in the old mines continues to greatly improve, being now 5′ wide of copper ore.

AUSTRALASIA.

VICTORIA.—From *Port Phillip and Colonial* the directors have advices, dated Clunes, April 22nd. During the month of March (six weeks) 4,931 tons of quartz were crushed, which yielded 1,751 oz. 16½ dwts. of gold. The receipts for the month amounted to 3,220*l.*; payments 2,226*l.*, leaving a profit of 994*l.* During the past month there has been but a partial supply of quartz, and the machinery has only crushed on an average 822 tons a week, while the plant is quite capable of crushing 1,200 tons. Mr. Munday's report on the state of the Clunes Mine has been received, and he states

that, on looking at the mine as a whole, there seems every reason to expect that under good management it will continue to yield prosperously for a long period. A great deal of ground has already been laid open, and the veins continue strong and show evidence of being auriferous in depth.

A discovery of gold has been made at *Rocky Flat*, which has caused great activity amongst the miners. There is but little doubt that these leads of gold will in time be found to join those from *Mount Greenock*, and if such is the case, there are yet many miles of unbroken ground to be worked. The number of miners at *Mount Greenock* is steadily increasing. At *Raywood* there was only a sufficient supply of water to enable them to extract gold from the poorer wash-dirt that has been accumulating. At *Blue Mountain* some deep leads of rich ore are being worked, and some of the reefs yield rich stone also.

SOUTH AUSTRALIA.—Advices from Adelaide state that the *Moonta* Mine has yielded another dividend. The miners at Wallaroo and Moonta had struck work, partly on a question of wages and partly from dissatisfaction with their treatment.

The 19th annual report of the *Burra Burra* Mining Company has been forwarded. The productiveness of the mines, though not quite equal to former times, continues very considerable. In the six months ended 31st of March, 3,950 tons of ore were raised, the average produce of which was estimated at 22½% of pure copper. The statement of assets and liabilities shows an expected surplus on the realization of copper and ore, still to be disposed of, of 15,339*l.*, which, together with balances carried forward, would make the balance at credit of profit and loss 18,116*l.* divisible among the shareholders.

From *English and Australian*, advices, dated April 27th, state that there were nine furnaces at work at the Port, six smelting, one roasting, and two refining.

At *Kapunda* the quantity of ores raised in February was 278 tons of 19½% average produce, equal to 54½ tons of pure copper, exclusive of 60 tons of sulphur ores for flux. The quantity raised in March is estimated at about 300 tons wet weight, and of good percentage.

From *Yudanamutana* advices state that at Yudanamutana mine the stopes leading to Mary's shaft have been yielding some very fine samples of rich gray ore; there is also a good lode at bottom, bearing south towards the "big boil"; there are several branches coming into this stope from the north-west. The levels north and south of this remain as before. In the engine shaft there is a good lode going down 2′ wide, of first-class ore—green and blue carbonates; the ground being very favourable for sinking. At Wheal Gleeson mine, Henry's shaft is down 20 fathoms. In the north end, driving towards the cross course, rich black ore been has cut. At Wheal Blinman mine, the stopes between Nos. 1 and 2 shafts are yielding a fair quantity of good ore. "The big bunch" does not decline in depth, but rather improves.

At *Great Northern* the shaft was down 13 fms. 2′ below the bottom level. The ground in the shaft continued much the same. A change of ground had been met with in the eastern end, but it was not making into the shaft so as to be of any advantage in sinking.

From *Worthing* the reports of the Bremer mine are the same as for some time past. A quantity of ore was in sight, and malleable and red oxide of copper had been cut in Tonkin's shaft on Boundy lode.

At *Scottish Australian*, the raising and shipping of coal at the Lambton Colliery was progressing favourably, and the quality of the coal is considered very good.

WESTERN AUSTRALIA.—From *Fortune* the directors have advices to the 25th of April, Captain Penbury reports that in the 40 fm. south-west end

the lode was 3′ wide, 6″ of which is a good branch of copper ore; it was then producing half-a-ton per fm. of good quality, and had greatly improved both in value and appearance; the stope in the back of this end was producing 3 tons of copper ore per fathom. In the 40 fm. north-east end the lode was small and unproductive.

Record of the Mining and Metal Markets.

METALLIC-ORE MARKETS.

TIN.—There has been no change in the standards for black tin since our last, quotations still standing at:—

Superior Fine	.. £103	Superior Common	.. £99
Second Fine	.. 101	Second Common	.. 98

COPPER.—At the four Cornish sales we give this month the number of tons, average produce, quantity of fine copper, average price per ton, and standard have been as follows:—

Date.	*Tons.*	*Produce.*	*Fine Copper.* Tons. cwt.	*Price per ton.*	*Standard.*
May 26.	3,912	6⅛	259 17	£5 6 6	£121 9 0
June 2.	3,122	6⅛	206 5	5 5 0	121 2 0
„ 9.	2,266	6⅞	156 2	5 11 0	120 13 0
„ 23.	4,025	6⅛	248 9	5 0 0	125 9 0

At the sale of May 26th, the standard was stationary. At the sale of June 2nd the standard declined 10*s.* At the sale of the 9th the standard advanced 10*s.*; and at that of the 23rd it was nearly stationary, so that it stands about the same as at the end of last month.

LEAD.—The prices of lead ores during the past month show an advance on those of last.

COAL MARKETS.

LONDON, *June 28th.*—From the returns of the Registrar of the London Coal Exchange, of the quantity of sea-borne coal, culm, and cinders, imported into London in the month of May, we learn that the total quantity was 254,304 tons, against 230,259 tons during the corresponding month of last year,—showing an *increase* of 24,045 tons.

The following are the particulars of the 254,304 tons imported during May:—

Newcastle ..	90,616	tons in	204 ships	Scotland ..	2,057	tons in	13 ships
Seaham ..	18,434	„	76 „	Wales ..	12,242	„	34 „
Sunderland .	72,078	„	171 „	Yorkshire ..	1,905	„	16 „
Middlesbro'.	7,081	„	23 „	Small ..	3,524	„	8 „
Hartlepool..	44,585	„	154 „	Cinders ..	1,243	„	8 „
Blyth ..	539	„	2 „				

The quantity of coal imported by railways and canals during the month of May was 186,421 tons against 127,239 tons in the corresponding month of last year,—showing an *increase* of 59,162 tons.

On May 30th, the new ships arrived were 54; a moderate demand in the market; Hetton Wallsend, 17*s.*; South Hetton Wallsend, 17*s.*

Stewart's Wallsend, 16*s.* 6*d.*; Braddyll's Wallsend, 16*s.*; Eden Main, 15*s.* 9*d.*; Hasting's Hartley, 15*s.* 6*d.*; Bute's Tanfield, 14*s.* On June 1st, new ships 23; a brisk demand at an advance of 6*d.* per ton. On the 3rd, new ships 17; market still brisk. On the 6th, new ships 35; an increased demand for house-coal at a further advance of 6*d.* per ton. On the 8th, new ships 34; market less active. On the 10th, new ships 37; business dull. On the 13th, 15th, and 17th, there was no variation. On the 20th, new ships 99; market active. On the 22nd, new ships 63; market steady. On the 24th, new ships 30; market firm for house-coal, and prices generally advanced 3*d.* per ton. On the 27th, new ships 90; market busy, with a further advance of 3*d.* per ton on house-coal, which were in increased demand. Hetton Wallsend, 17*s.* 6*d.*; South Hetton Wallsend, 17*s.* 3*d.*; Haswell Wallsend, 17*s.*; Hartlepool Wallsend, 17*s.*; Caradoc Wallsend, 16*s.* 6*d.*; Gosforth Wallsend, 15*s.* 3*d.*; Whamcliff Wallsend, 15*s.* 3*d.*; Hasting's Hartley, 16*s.*; Bute's Tanfield, 14*s.*

LIVERPOOL.—From Messrs. J. and T. Platt's Coal Circular we find that the quantity of coal, cannel, coke, and patent fuel shipped from Liverpool to foreign and colonial ports during the month of May was 52,382 tons, against 31,134 tons during the corresponding month of last year—showing an *increase* of 21,248 tons. The exports coastwise during May were 13,056 tons, against 6,686 tons during the same month last year—showing an *increase* of 6,370 tons. The total exports coastwise from January to May were 54,285 tons, against 32,808 tons during the corresponding period of 1863—showing an *increase* of 21,477 tons.

CONTRACTS FOR COAL.—The Royal Spanish Naval Commission require tenders for two years' supply of coal for the navy. The Nottingham Gas-Light and Coke Company require the supply of 40,000 tons, and the Derby Gas-Light and Coke Company 14,000 tons, of soft coal and soft Cobbles or Nuts. The Admiralty require 1,000 tons of South Wales coal for the steam vessels at St. Paul de Loando, and the Royal Spanish Naval Commission 24,000 tons of the same, to be delivered at the Philippine Islands.

SHARE MARKETS.

LONDON, *June 28th.*—The London share market has been specially dull during the last month, transactions being few and prices in a great number of cases merely nominal. At the close of May there was some show of business, but after the first few days in June transactions fell off and prices receded continually until the middle of the month, when, on the reduction of the Bank rate of discount, there was a temporary rally. This, however, soon subsided and the market closes in a duller state than has been experienced for some considerable period. The low prices of metals unfavourably affect the larger mines; and the number of new and speculative concerns recently launched by the brokers is obviously beyond the public demand. The following are the principal alterations:—

Declined.

Wheal Grenville	slightly	North Treskerby	£1⅛
Wheal Seton	£2½	South Tolgus	1
Condurrow	25	Nanjiles	2½
Wheal Trelawny	2	Clifford Amalgamated ..	1¼
Cargoll	2	Grambler and St. Aubyn ..	5
East Lovell	3	Wheal Rose	1
Great Wheal Vor	2	Devon Great Consols.. ..	10
Great Wheal Fortune ..	1½	St. John Del Rey	6½
Wheal Kitty (Lelant) ..	2½	Cape Copper	1¼
Providence	1	Nova Scotia Gold and Land..	1

Advanced.

East Grenville ..	.. slightly	Sithney Carnmeal ..	.. slightly
South Frances ..	.. £10	East Carn Brea ..	.. slightly
West Seton	.. 30	East Caradon ..	.. £1
Cook's Kitchen ..	.. 2	East Russell ..	.. slightly
Stray Park	.. 2	Hingston Down ..	.. £1
Wheal Ludcott and Wrey	.. slightly	Cobre	.. 1½

A considerable amount of business has been reported in *Wheal Grenville* shares, though prices have not fluctuated very much. They opened at 8¼*l.*-8¾*l.*, and close lower at 7½*l.*-7¾*l.* *East Grenville* shares have been slightly better at 5*l.*-5¼*l.* *East Basset* shares opened on the 30th at a reduction of 1*l.*, but improved on the 6th to last month's price of 65*l.*-67*l.*, at which they leave off. There has been an advance of 10*l.* in *South Frances* shares, from 40*l.*-45*l.* to 50*l.*-55*l.* *West Frances*, 29*l.*-31*l.* *Wheal Buller*, 27*l.*-29*l.* *South Grenville*, 10*s.*-12*s.* 6*d.*

Wheal Seton shares have not fluctuated so much since our last. They opened on the 30th at 222½*l.*-227½*l.*, and advanced until the 13th to 230*l.*-235*l.*, but since then they have again declined and close at 220*l.*-225*l.* There has been a steady advance in *West Seton* shares from their opening price of 170*l.*-180*l.* to their closing one of 200*l.*-210*l.* *North Crofty*, 4¼*l.*-4¾*l.*

Cook's Kitchen shares have been looking up a little. They opened at 17½*l.*-18½*l.*, but on the 10th they were inquired for at an advance of 3*l.* 10*s.*, making them 21*l.*-22*l.*, at which price they remained until the 22nd, when they dropped to 20*l.*-21*l.*, at which they close. *Stray Park* shares were pretty steady until the 11th, at 31*l.*-33*l.*, but leave off lower at 30*l.*-31*l.* There has been a decline of about 25*l.* in *Condurrow* shares from their last quotation in April of 100*l.*-105*l.*, to their present one of 70*l.*-80*l.* *Tincroft*, 17½*l.*-18*l.* *Carn Camborne*, 1*l.*-1¼*l.*

West Chiverton shares opened on the 30th at their last price of 70*l.*-75*l.* On the 9th they went down to 65*l.*-70*l.*, but on the 11th were better at 67½*l.*-72½*l.*, and before closing rallied to their opening price of 70*l.*-75*l.* There has been a further decline of 2*l.* in *Wheal Trelawny* shares, which are now quoted at 19½*l.*-20½*l.* *Cargoll* shares have receded to 29*l.*-30*l.* *Wheal Ludcott and Wrey* shares are a little firmer at 2*l.*-2½*l.* *Wheal Chiverton*, 10*l.*-10½*l.* *Herodsfoot*, 39*l.*-41*l.* *Wheal Mary Ann*, 14½*l.*-15½*l.* *Wheal Hope*, 4½*l.*-5*l.* *North Shepherds*, 4¾*l.*-5¼*l.* *North Chiverton*, 2*l.*-2¼*l.* *Wentworth Consols*, 16½*l.*-17½*l.*

The slight advance in *East Lovell* shares, which was noticed in our last, has not been maintained, but on the contrary there has been a fall of about 3*l.* Shares opened on the 30th at 20¼*l.*-20¾*l.*, and close at their lowest price of 17½*l.*-18*l.* There have been some fluctuations in *Great Wheal Vor* shares which opened on the 30th at 32½*l.*-33½*l.* On the 8th they stood at 34½*l.*-35*l.*, but have since again declined and close at 30½*l.*-31½*l.* *Great Wheal Fortune* shares have declined all through the month from their opening quotation of 14*l.*-15*l.* to their closing one of 12½*l.*-13½*l.* *Wheal Kitty* (Lelant) shares have receded 2½*l.* since their last quotation in April to 11*l.*-11½*l.* *Providence* shares are also lower at 38½*l.*-39½*l.* *Sithney Carnmeal*, shares are firmer at 7*l.*-7½*l.* *Trenerom*, 3½*l.*-3½*l.* *Wheal Margaret*, 14*l.*-15*l.* *Sithney Wheal Metal*, 3*l.*-3½*l.* *East Wheal Vor*, 5*l.*-5½*l.* *Great East Lovell*, 3½*l.*-4*l.*

East Carn Brea, shares have been considerably dealt in. They opened at 7½*l.*-8*l.*, and at one time went up to 9*l.*-9½*l.*, but close lower at 7⅞*l.*-7¾*l.* *North Treskerby* shares have not been so firm and close dull at 1¾*l.*-2*l.* *South Tolgus* shares have receded from 38*l.*-40*l.* to 37*l.*-39*l.* *Wheal Uny*, 5¾*l.*-6*l.* *South Carn Brea*, 5*s.*-10*s.* *Great South Tolgus*, 2¼*l.*-2½*l.* *North Downs*, 1½*l.*-1¾*l.*

Nanjiles shares have again gone back, and are now quoted at 27½*l.*-28*l.* *Clifford Amalgamated* shares opened flat on the 30th, at 33½*l.*-34*l.*, but advanced a little up to the 11th, when they were quoted at 36*l.*-36½*l.* They have since receded and close at 31½*l.*-32½*l.* *Grambler and St. Aubyn* shares have declined 5*l.* to 5*l.*-7*l.* *Wheal Rose* shares have also dropped from 44*l.*-46*l.* to 43*l.*-45*l.* *Great Wheal Busy*, 3*l.*-3¼*l.* *Hallenbeagle*, 3½*l.*-3¾*l.* *Great North Downs*, 5½*l.*-6*l.*

East Caradon shares opened on the 30th, slightly lower, at 28*l.*-28½*l.*, but have since advanced, and close at 29½*l.*-30*l.*, being an improvement of 1*l.* upon our last prices. *Glasgow Caradon*, 3¾*l.*-4*l.* *Gonamena*, 3¾*l.*-4*l.* *Marke Valley*, 5*l.*-5¼*l.* *South Caradon Wheal Hooper*, 6*s.*-8*s.*

East Russell shares have advanced from their opening price of 3½*l.*-4*l.* to their closing one of 4*l.*-4½*l.* *Devon Great Consols* shares have declined 10*l.* to 560*l.*-570*l.* *Hingston Down* shares have been better at 4¼*l.*-4½*l.* *Wheal Crebor*, 2½*l.*-2¾*l.* *New Martha*, 1¼*l.*-1½*l.* *Lady Bertha*, 7*s.* 6*d.*-10*s.* *North Robert*, 6*s.*-8*s.*

New Rosewarne, 9*l.*-11*l.* *Prosper United*, 4½*l.*-5*l.* *Wheal Unity*, 6*s.*-8*s.* *East Rosewarne*, 2¾*l.*-3*l.* *Pendeen*, 4*l.*-4¼*l.*

Among Welsh and Isle of Man undertakings, *Great Laxey* shares have improved to 14½*l.*-15*l.* *Prince of Wales* shares have been quoted at 5*s.* 6*d.*-7*s.* 6*d.* *Rhymey Iron*, 27¼*l.*-27½*l.*, and *Rhymey Iron New*, at 8⅜*l.*

In foreign and colonial shares very little business has been reported, the principal feature having been a heavy drop in *St. John Del Rey* shares, which at the beginning of the month were pretty firm at 46¼*l.*-46¾*l.*-47*l.*, but have steadily declined all through the month, and close at 40*l.* *Cape Copper* shares have also been dull at 10½*l.* *Cobre* shares have been a little firmer at 34*l.*-36*l.* *Nova Scotia Gold and Land* were last quoted at 1⅞*l.*, though they have been during the month up to 3⅜*l.* *Fortuna*, 3¾*l.* *United Mexican*, 5⅜*l.* *Panulcillo*, 1⅜*l.* *Worthing*, 17*s.* 6*d.*-20*s.* *Yudana-mutana*, 2½*l.* *Don Pedro North Del Rey*, 10*s.* *Santa Barbara*, 10*s.* *Port Phillip*, 1⅜*l.* *English and Australian Copper*, 1½*l.* *East Del Rey*, 10*s.* *Kapunda*, 1¼*l.* *Pontgibaud*, 8*l.* *Montes Aureos*, 2¼*l.* *Scottish Australian*, 12*s.* 6*d.* *Peel River Land and Mineral*, 44*l.* *Alamillos*, 1*l.* *Anglo-Mexican Mint*, 19*l.*-18¾*l.* *Linares*, 6*l.* *Quebrada Land and Mining*, 3⅜*l.*-3¾*l.* *Gellivara*, 1¾*l.* *Vallanzasca*, 1¼*l.*-⅜*l.*

Among new undertakings, *Great North Vor* shares have been quoted at 1*l.*-1½*l.* pm.

CORNWALL.—At the beginning of the month a general activity characterised the Mining share market on account of the reduction in the rate of discount, but during the last fortnight there has been less business done. *East Grenville* shares have been largely dealt in at 5¼*l.*-5½*l.* *Wheal Seton* shares have remained firm at 225*l.* *East Caradon* shares have been steady, and were last quoted at 29*l.*-30*l.* *Cargoll* shares went up at one time to 35*l.*, but close lower at 30*l.*-32*l.* *Great Wheal Vor*, 31½*l.* *West Seton*, 200*l.* *Wheal Rose*, 39*l.*-40*l.*

BIRMINGHAM.—*Munts's Metal* shares, 17*s.*-6*d.* 20*s.* dis.

MANCHESTER.—There have been but few variations in the prices of shares here. *Chiverton*, 11¼*l.*-11½*l.* *Trelawny*, 20¼*l.*-20¾*l.* *East Caradon*, 29½*l.*-30*l.*

LIVERPOOL.—*Copiapo and Caldera*, 146*l.*

NEWCASTLE.—The mininig share market here has been quiet and little business has been reported. *North Crofty*, 4½*l.*-5*l.* *Nether Hearth*, 5*s.*-10*s.* *Wheal Chiverton*, 11*l.*-11½*l.* *Wentworth Consols*, 16*l.*-17*l.*

DUBLIN.—Towards the middle of the month there was a general inquiry for shares in the Irish mining market, with a demand for *Mining Company of Ireland* shares, which have gone up and were last quoted at

25½*l.* *General Mining Company of Ireland*, 4*l.* *Connorree* shares have been in better demand at 17*s.* 9*d.* *Wicklow Copper*, 11½*l.*

NEW YORK, *June 7th.*—In the mining share market the following have been the principal quotations: *American Coal*, $103; *Ashburton Coal*, $15; *Aztec Copper*, $7; *Benton*, $1-$2; *Boston Copper*, $6; *Bucks County*, $1-$1¼; *Canada*, $2¾-$3; *Caledonia*, $14½; *Carp Lake*, $4½; *Clute*, $1¾-$3; *Copper Falls*, $40; *Central*, $75; *Copake Iron*, $11; *Columbian*, $12; *Clifton*, $2; *Central Coal*, $73; *Evergreen Bluff*, $18; *Flint Steel River*, $14; *Franconia*, $1½; *French Creek*, $1⅞; *Hilton*, $5-$6; *Hancock*, $4-$6; *Hamilton*, $7; *Hudson*, $2¼; *Indiana*, $9½; *Isaac's Harbour*, $3½; *Isle Royal*, $23½-$25; *Keweenaw*, $6; *Knowlton*, $10; *Lafayette*, $2-$2¼; *Manhattan*, $7; *Maryland*, $2¼; *Mendota*, $5½; *Merrimac*, $4⅞; *Minesota*, $63-$65; *Mariposa*, 47½; *Montana*, $⅞-$1½; *Norwich*, $8; *New York*, $1¼; *New York and Nova Scotia Gold*, $⅝-$⅞; *Ontonagon*, $5½; *Ogima*, $7; *Pennsylvania Coal*, $210; *Providence*, $2½; *Quincy*, $89; *Reliance*, $2¾; *Rockland*, $14-$15; *Teal Lake Iron*, $6½. [*** American Gold, $194.]

SAN FRANCISCO, *May 7th.* — The mining share market has been generally active during the past month, but stocks have changed hands mostly at declining rates. The pressure on the money market, and the anticipated tax of 5°/₀ on the gross yield of the mines has forced upon sale large quantities of stocks that would otherwise have lain quiet.

Real del Monte shares have been freely offered, and prices have declined to $53-$60. *Gould and Curry* shares have had to yield to the universal pressure, and have dropped to $3,875. A dividend of $125 per foot has been declared. *Ophir* shares have again heavily declined, and were last quoted at $1,010. *Savage* shares have receded to $2,200. A dividend of $50 per foot has been declared. *North Potosi* shares have been largely dealt in, and prices have advanced to $98. A good business has been done in *Lady Bryan* shares at lower rates; prices close at $40. *Challar*, $350. *Daney*, $90. *North American*, $155-$165. *Burning Moscow*, $90-$95. *Blue Ledge*, $23. *Wide West*, $24-$26. *Silver Hill*, $16. *Seneca*, $27. *Buckeye*, $14-$16. *Harmon*, $24. *Crockett*, $7½. *Pride of the West*, $47. [*** Quotations in Gold: Legal Tender Notes 58°/₀.]

METAL MARKETS.

LONDON, *June 28th.*—At the beginning of the month, the reduction in the rate of discount acted favourably upon the metal market, and business assumed a slightly firmer tone, but it has again given way on account of the unsettled state of affairs on the Continent, and has been very much depressed.

IRON.—The market for this metal has been very dull. Scotch pig has declined all through the month and closes heavy at 56*s.* 9*d.* Welsh bars and rails have been very quiet, and prices have tended rather in buyers' favour. Staffordshire descriptions are about the same as last month. Swedish iron has been quiet.

COPPER.—The market for this metal has been dull all through the month and on the 10th the smelters made a reduction of 5*l.* per ton, without having previously given intimation that they were going to do so, which caused great dissatisfaction amongst buyers, and many withdrew for the time. Nothing of much importance has lately been done, and both manufactured and raw could be had under official rates. There has been little doing in foreign. Burra, 96*l.* Kapunda 97*l.*

TIN.—The amount of business transacted in this article has been limited, and it has been obtainable under fixed rates. Foreign has also been dull. Straits, 106*l.*; Banca, 110*l.*

TIN PLATES have been quiet, transactions having been checked by the advance in the American tariff.

LEAD.—The demand for this metal has been limited, and sellers have been willing to accept orders at lower rates. Common English 21*l.* 5*s.* to 21*l.* 10*s.*; L B., 21*l.* 15*s.*; W B, 22*l.* 15*s.*

SPELTER.—This is the only article in which any considerable amount of business has been done, and at one time prices advanced to 24*l.* 5*s.* on the spot and 24*l.* 10*s.* forward. They have, however, since given way and close at 23*l.* 5*s.* on the spot, and 23*l.* 10*s.* forward.

GLASGOW, *June 28th.* IRON.—The Scotch pig-iron market has been very quiet all through the month. Prices opened on May 30th at 59*s.* 9*d.* cash, sellers; buyers 59*s.* 6*d.* No. 1, G.M.B. 59*s.* 3*d.*; No. 3, 58*s.* 6*d.*, but have declined ever since, and close at 56*s.* 9*d.* cash. No. 1, G.M.B., 56*s.*; No. 3, 55*s.* 3*d.*

PARIS, *June 26th.*—COPPER has gone back and is now quoted at, English, 237½ fr.; Lake Superior, 300 fr.; Chili, 220 fr.

TIN is also lower, Banca, 290 fr.; English, 272½ fr.;

LEAD.—This metal has been in little demand, and prices remain unaltered.

SPELTER has advanced to 63 fr.

COLOGNE, *June 26th.*—Little business has been done in the metal market during the last few weeks. COPPER remains unaltered. TIN has been weaker, and LEAD and SPELTER has been in fair demand.

ROTTERDAM, *June 23rd.*—The Banca sale to take place on the 29th, will include 146,921 slabs, against 119,092 in 1863.

HAMBURG, *June 24th.*—The metal market has been quiet during the past month, and prices have varied but little.

IRON.—Scotch pig, 2¾ mk.; English in bars, 6½ to 6¾ mk.; Staffordshire descriptions, 7½ to 7¾ mk. Swedish, 8¼ mk.

COPPER.—This article has been in better demand, and prices have slightly advanced. English, 70 mk.; Demidoff, 74 mk.

TIN.—In this metal prices are only nominal, and no business doing.

SPELTER.—Business in this metal has been a little more active latterly, than it was at the beginning of the month, and prices are firmer.

STETTIN, *June 24th.* COPPER.—Little business has been done in this metal, and prices remain about the same.

SPELTER has been quoted at from 8 to 8¼ thlr.

BERLIN, *June 24th.* IRON.—Scotch pig, 51 to 53½ sgr.; iron in bars, 3⅝ thlr.; Staffordshire descriptions, 5¼ thlr.

COPPER.—English, 31 thlr.; Paschkoff, 42 thlr.; Demidoff, 37 thlr.

TIN has been very quiet. Banca has been quoted from 37 to 38 thlr.

LEAD remains unaltered.

AMOY, *April 21st.*—LEAD.—367 pigs, at $7 to $7·30 per picul. Stock 2,759 pigs.

Furnished by Von Dadelszen and North, 158, Leadenhall Street, London, E.C.

During the past month the metal market has been characterised by dullness (with only one exception), and prices have given way in nearly every instance. The increased ease which we have experienced in the money market, has been counteracted by the very serious appearance which politics have of late assumed.

IRON.—We cannot report an actual change in the value of Welsh bars and rails, although there is a great want of animation in these articles. Staffordshire have gradually tended downward, and makers are willing to take orders subject to next quarter-day's prices. In Scotch pigs a fall of at least 3*s.* per ton has occurred since our last. We quote 3 months open parcels at 58*s.*, and cash 56*s.* 9*d.*

COPPER.—The market was very flat during the earlier part of the month, and 5*l.* per ton under official prices was readily taken for second hand parcels; when on the 10th the smelters reduced the official price 5*l.* per ton all round, which for a time created steadiness; since then parcels have been obtainable from 1*l.* to 2*l.* under. In foreign little or nothing is doing. We quote Burra, 96*l.*; and Kapunda, 97*l.*

TIN.—This market has continued its downward tendency, and prices are lower now than we have seen them for some years past; at one time Straits was offered at 104*l.*, and English in proportion; it has since rallied in anticipation of the Dutch sale giving some tone to the market. We quote Straits, 106*l.*; and Banca, 110*l.*, very little of the latter being on this side, the price is quite nominal.

TIN PLATES are not so firm as at the beginning of the month.

LEAD is somewhat flatter.

In SPELTER a very large business has been done up to 24*l.* 5*s.* per ton spot, and 24*l.* 10*s.* forward. The less warlike appearance of things has caused a reaction to 23*l.* 12*s.* 6*d.* spot, and 23*l.* 15*s.* forward.

THE BOARD OF TRADE RETURNS.

The "Accounts relating to Trade and Navigation of the United Kingdom, for the month ended 30th April, 1864, and four months ended 30th April, 1864," have been issued by the Statistical Department, Board of Trade.

IMPORTS.—The quantities and relative increase and decrease of the imports of metals, metallic ores, and mineral products, for the month and four months ended 30th April, have been as follows:—

	Month ended 30th April.			Four Months ended 30th April.		
	1863.	1864.	Increase (+) or Decrease (−)	1863.	1864.	Increase (+) or Decrease (−).
Brimstone ... ... cwt.	36,070	64,205	+ 28,135	279,608	190,461	− 89,147
Copper Ore ... ...tons	7,812	6,923	− 889	23,473	21,111	− 2,362
Copper Regulus ... ... „	2,472	2,809	+ 337	8,103	7,897	− 206
Copper, unwrought and part wrought ... } cwt.	13,860	25,040	+ 11,180	62,560	115,240	+ 52,680
Iron, in Bars, unwrought, tons	1,546	2,383	+ 837	3,581	7,181	+ 3,600
Steel, unwrought ... „	176	436	+ 260	468	1,742	+ 1,274
Lead, Pig and Sheet ... „	1,173	2,079	+ 906	6,913	9,955	+ 3,042
Spelter or Zinc ... ... „	2,652	3,181	+ 529	6,130	11,084	+ 4,954
Tin, in Blocks, Ingots, Bars, or Slabs ... } cwt.	5 277	8,440	+ 3,163	11,607	15,791	+ 4,184
Silver Ore... ... value in £	56,073	38,114	− 17,959	113,813	96,720	− 17 093
Petroleum ... ...tuns	7,046	231	− 6,815	11,806	4.323	− 7,483
Pyrites ... ...tons	12 659	11,738	− 921	41,945	28,717	− 13,228
Quicksilver ... ... lbs.	112,770	195,374	+ 82,604	358,098	1,195,413	+837,315

EXPORTS.—The quantities, declared value, and relative increase and decrease of the exports of metals, minerals, and metallurgical articles of British and Irish produce and manufactures, for the month and four months ended 30th April, have been as follows:—

	QUANTITIES.				DECLARED VALUE.					
	Month ended 30th April.		Four Months ended 30th April.		Month ended 30th April.			Four Months ended 30th April.		
	1863.	1864.	1863.	1864.	1863.	1864.	Increase (+) or Decrease (−)	1863.	1864.	Increase (+) or Decrease (−)
					£	£	£	£	£	£
Alkali: Soda ... ...cwt.	236,104	228,060	712,930	716,497	97,997	93,120	− 4,877	296,280	294,011	− 2,269
Coal, Cinders, and Culm ...tons	792,531	784,371	2,473,294	2,674,049	345,791	364,464	+ 18,673	1,111,327	1,267,487	+ 156,160
Iron, Pig and Puddled ... ... ,,	46,259	51,458	139,918	134,383	127,188	155,773	+ 28,585	385,819	412,412	+ 26,593
Iron, Bar, Angle, Bolt, and Rod... ,,	32,111	29,353	103,913	101,251	237,760	277,061	+ 39,301	765,776	932,547	+ 166,771
Iron, Railroad, of all sorts ... ,,	40,048	45,924	124,256	141,819	280,321	380,795	+ 100,474	876,527	1,135,879	+ 259,352
Iron, Cast ... ... ,,	7,645	6,187	27,109	19,283	63,274	58,763	− 4,511	230,105	187,715	− 42,390
Iron Hoops, Sheets, and Boiler Plates ... ... ,,	13,401	11,758	39,503	40,705	154,187	170,441	+ 16,254	441,275	576,654	+ 135,379
Iron, wrought, of all sorts ... ,,	12,738	11,439	33,021	32,554	220,001	231,099	+ 11,098	616,896	668,643	+ 51,747
Iron, old, for re-manufacture ... ,,	2,638	767	7,018	2,999	9,264	3,324	− 5,940	24,628	12,906	− 11,722
Iron Steel, unwrought ... ... ,,	2,461	2,753	8,523	10,934	81,489	88,978	+ 7,489	267,957	346,224	+ 78,267
Copper, unwrought, in Ingots, Cakes, or Slabs ... ... cwt.	32,156	7,574	77,023	29,031	144,187	38,710	− 105,477	352,322	152,407	− 199,915
Copper, wrought or partly wrought, Bars, Rods, Bottoms, Pans, Plates, Sheets, and Nails; and mixed or Yellow Metal for Sheathing .. ,,	60,480	29,737	165,515	130,156	276,291	153,371	− 122,920	758,554	680,150	− 78,404
Copper, wrought, of other sorts... ,,	583	870	3,025	2,685	3,685	6,117	+ 2,432	18,289	18,157	− 132
Brass of all sorts ... ... ,,	3,650	3,016	12,288	10,896	18,221	17,707	− 514	60,819	61,938	+ 1,119
Lead, Pig, Rolled, Sheet, Piping, Tubing, and Lead Shot tons	3,048	4,028	11,779	13,160	64,966	87,609	+ 22,643	256,031	286,037	+ 30,006
Lead Ore, Lead, Red and White, and Litharge of Lead ... ,,	906	726	2,116	2,076	21,544	17,955	− 3,589	50,281	52,210	+ 1,929
Tin, unwrought ... ...cwt.	7,147	6,240	22,971	28,100	43,229	35,065	− 8,164	134,297	158 025	+ 23,708
Tin Plates ... ... ,,	135,180	128,746	374,621	384,847	156,347	164,341	+ 7,994	435,949	486,039	+ 50,090
Zinc or Spelter, wrought or unwrought ... ... ,,	7,600	9,555	27,325	38,913	7,091	9,401	+ 2,310	27,000	41,112	+ 14,112
Salt ... ...tons	76,222	85,390	191,620	185,581	33,330	38,839	+ 5,509	85,182	86,850	+ 1,668
				£	2,386,163	2,392,933	+ 5,770	7,195,314	7,857,383	+ 662,069

LONDON PRICES CURRENT OF METALS.

From Messrs. JAMES and SHAKSPEARE'S, 10, Austin Friars, E.C., *28th June.*

						Per Ton.		
IRON	Rails in Wales	£7	0	0	@	£7	5	0
Welch	Bars „	7	0	0	„	7	5	0
	„	8	0	0	„	8	5	0
Staffordshire	„	9	10	0	„	10	0	0
	Nail Rods	9	10	0	„	10	0	0
	Hoops	10	10	0	„	11	10	0
	Sheets	11	10	0	„	12	0	0
Scotch	Pig (mixed Nos. warrants) in the Clyde	—			„	2	16	9
Swedish Hammered	Iron: Large sizes	12	10	0	„	12	15	0
	Iron: Indian assortments	12	10	0	„	13	0	0
	Steel: Faggot	16	10	0	„	17	10	0
	Steel: In kegs (½ and ⅝ in.)	15	10	0	„	16	0	0
						Per Unit.		
COPPER	Ore	—			@	17*s.*	0*d.*	
	Regulus	—			„	17*s.*	0*d.*	
	Barilla	—			„	18*s.*	6*d.*	
						Per Ton.		
	Chili Slab (for 96% pure Copper)	—			none	—		
	Spanish Cake	£88	0	0	@	£90	0	0
Australian	Burra and P.C.C.	—			„	98	0	0
	Kapunda	98	0	0	„	100	0	0
	Wallaroo	—			„	98	0	0
	Cadia	—			„	98	0	0
American	Baltimore / Lake Superior	—			none	—		
English	Tough Cake and Ingot and Tile	—			@	93	0	0
	Best selected Ingot	—			„	96	0	0
	Sheets, Sheathing and Rod	—			„	100	0	0
	Flat Bottoms	—			„	105	0	0
						Per lb.		
YELLOW METAL	Sheets	7¾*d.*			@	8*d.*		
	Sheathing and Rod	8*d.*			„	8¼*d.*		
						Per Cwt.		
TIN English	Common Blocks and Ingots	106*s.*			@	108*s.*		
	„ Bars (in barrels)	107*s.*			„	109*s.*		
	Refined	—			„	113*s.*		
Foreign	Straits, Fine	104*s.*			„	105*s.*		
	„ (with 3 months' prompt)	—			„	108*s.*		
	Banca	107*s.*			„	110*s.*		
						Per Box.		
TIN PLATES	Charcoal IC, best	30*s.*	0*d.*		@	31*s.*	0*d.*	
	„ IX „	36*s.*	0*d.*		„	37*s.*	0*d.*	
	Coke IC	23*s.*	6*d.*		„	26*s.*	0*d.*	
	„ IX	29*s.*	6*d.*		„	32*s.*	0*d.*	
						Per Ton.		
LEAD English	Sheet	£21	17	6	@	£22	0	0
	Pig—W.B.	—			„	22	15	0
	„ Other good brands	21	10	0	„	21	15	0
Foreign	„ German and Spanish, soft	20	10	0	„	20	15	0
English	Red	—			„	23	0	0
	Shot	—			„	24	0	0
	Dry White	—			„	26	10	0
SPELTER	(Silesian) in Cakes	23	15	0	„	24	0	0
ZINC	(Sheet) No. 9 and upwards	—			„	28	0	0
						Per Bottle.		
QUICKSILVER	(in bottles containing 75lbs. each)	8	10	0	@	8	15	0
						Per Ton.		
REGULUS OF ANTIMONY, French Star		36	0	0	@	37	0	0

Tabular Abstract of Mining Accounts for the Month.

Date of Account.	Name of Mine, and Number of Shares.	Balances. Debit.	Balances. Credit.	Calls. Per Share.	Calls. Total.	Dividends. Per Share.	Dividends. Total.
		£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
	CORNISH & DEVON MINES.						
May 23	New Hendra (400)	87 10 6	—	0 7 6	150 0 0	—	—
,, 24	Gonamena (6,144)	—	850 0 9	—	—	—	—
,, 24	North Jane (2,000)	1,041 2 8	—	0 10 0	1,000 0 0	—	—
,, 25	West Basset (6,000)	—	1,531 4 2	—	—	—	—
,, 25	Wheal Harriett (5,120)	—	839 4 6	—	—	—	—
,, 25	Providence (1,120)	—	1,403 9 3	—	—	1 0 0	1,120 0 0
,, 25	Wheal Margaret (896)	1,065 12 10	—	—	—	—	—
,, 26	Wheal Grenville (6,000)	1,149 19 5	—	0 5 0	1,500 0 0	—	—
,, 26	East Lovell (1,906)	—	1,304 0 0	—	—	0 10 0	953 0 0
,, 26	Craddock Moor (1,055)	—	1,089 14 11	—	—	—	—
,, 27	Cargoll (916)	—	1,311 0 0	—	—	0 10 0	458 0 0
,, 28	Nun's Cross (?)	—	20 4 9	0 15 0	(?)	—	—
,, 30	Wheal Trerew (1,024)	—	116 3 10	0 10 0	512 0 0	—	—
,, 30	North Buller (1,024)	206 0 0	—	0 12 6	640 0 0	—	—
,, 31	East Basset & Grylls (1,000)	—	—	0 10 0	500 0 0	—	—
,, 31	South Caradon (512)	—	5,671 9 4	—	—	6 0 0	3,072 0 0
,, 31	Trevenen and Tremenheere (5,600)	1,519 5 4	—	0 4 0	1,120 0 0	—	—
,, 31	East Basset (512)	—	1,770 0 0	—	—	2 0 0	1,024 0 0
,, 31	Yarner (3,097)	438 17 7	—	0 2 6	387 2 6	—	—
,, 31	Roskear (6,000)	—	2,758 13 7	—	—	—	—
June 1	West Par Consols (19,000)	1,577 0 0	—	0 1 6	1,425 0 0	—	—
,, 1	West Sharp Tor (256)	—	185 16 7	3 0 0	768 0 0	—	—
,, 1	Trelyon Consols (572)	850 5 5	—	1 0 0	572 0 0	—	—
,, 1	East Rosewarne (5,000)	—	882 2 8	—	—	—	—
,, 1	Boscaswell (1,248)	—	646 0 0	—	—	0 5 0	312 0 0
,, 1	Condurrow (256)	8,639 10 10	—	10 0 0	2,560 0 0	—	—
,, 2	Carn Brea (1,000)	—	5,461 12 10	—	—	2 0 0	2,000 0 0
,, 2	Charlotte United (6,000)	—	—	0 5 0	1,500 0 0	—	—
,, 6	Retanna Hill (128)	—	—	3 0 0	384 0 0	—	—
,, 7	Great Fortune (1,798)	—	1,015 10 8	—	—	—	—
,, 7	Wheal Basset (512)	—	1,832 0 0	—	—	1 10 0	768 0 0
,, 7	North Treskerby (5,936)	—	559 16 11	—	—	0 2 6	742 0 0
,, 7	Devon Copper (?)	58 14 11	—	0 1 6	(?)	—	—
,, 7	Esther United (6,144)	474 6 0	—	0 1 6	460 16 0	—	—
,, 7	Sortridge Consols (12,000)	—	104 16 11	0 2 0	1,200 0 0	—	—
,, 13	Dolcoath (358)	—	3,221 12 4	—	—	7 0 0	2,506 0 0
,, 13	Wheal Seton (396)	—	2,250 8 10	—	—	4 0 0	1,584 0 0
,, 14	Wheal Mary Ann (1,024)	—	1,916 0 0	—	—	0 10 0	512 0 0
,, 14	Spearne Moor (280)	324 5 3	—	1 0 0	280 0 0	—	—
,, 14	West Great Work (3,500)	1,707 17 0	—	0 7 6	1,312 0 0	—	—
,, 14	Great Work Consols (119)	—	1,161 4 2	—	—	5 0 0	595 0 0
,, 15	Great Wheal Vor (5,908)	—	6,403 0 0	—	—	0 12 0	3,544 0 0
,, 16	Wheal Uny (4,096)	158 16 2	—	—	—	—	—
,, 16	Great West Chiverton (3,000)	—	—	1 0 0	3,000 0 0	—	—
,, 17	East Wheal Vor (6,000)	—	5,400 0 0	—	—	—	—
,, 17	Gawton Copper (4,000)	89 8 6	—	0 1 6	300 0 0	—	—
,, 17	Great Caradon (4,096)	—	26 14 6	0 2 0	409 12 0	—	—
,, 17	East Russell (4,000)	269 15 5	—	0 5 0	1,000 0 0	—	—
	Spearne Consols (794)	395 15 3	—	0 5 0	198 10 0	—	—
,, 17	Carnyorth (2,048)	1,372 15 9	—	0 5 0	512 0 0	—	—
,, 17	Crane (861)	1,114 19 10	—	1 5 0	1,076 5 0	—	—
,, 18	East Gunnis Lake and South Bedford (4,000)	—	32 12 9	0 5 0	1,000 0 0	—	—
,, 21	Tincroft (6,000)	—	2,751 0 0	—	—	0 12 6	3,750 0 0
,, 21	Wheal Polmear (1,024)	—	8 4 8	—	—	—	—
,, 22	Clifford Amalgamated (2,900)	—	1,467 0 0	—	—	0 10 0	1,450 0 0
,, 22	North Downs (6,000)	960 18 6	—	0 2 6	750 0 0	—	—
,, 22	South Carn Brea (6,000)	—	116 15 0	0 1 6	450 0 0	—	—
	WELSH & OTHER MINES.						
May 30	South Darren (6,000)	31 0 0	—	—	—	—	—
June 8	Great Laxey (12,500)	—	—	—	—	0 5 0	3,125 0 0
,, 8	Bedol-Aur (3,200)	99 18 6	—	0 2 0	320 0 0	—	—
,, 9	Bryntail (1,832)	186 0 1	—	0 3 0	274 16 0	—	—
,, 16	Prince of Wales (12,800)	127 14 9	—	0 0 6	320 0 0	—	—
,, 16	Bryn Gwiog (500)	268 2 0	—	1 0 0	500 0 0	—	—
,, 22	Foxdale (2,800)	—	—	—	—	1 0 0	2,800 0 0
	FOREIGN MINES.						
June 20	Kapunda (68,000)	—	6,380 1 0	—	—	0 1 0	3,400 0 0
,, 24	St. John Del Rey (11,000)	—	—	—	—	2 10 0	27,500 0 0

Copper Ores.

Sampled May 11, and sold at the Royal Hotel, Truro, May 26.

Mines.	Tons.	Purchasers.	Price.	Mines.	Tons.	Purchasers.	Price.
South Caradon	91	1	£13 11 6	Wheal Rose.....	52	4, 6	£7 0 6
	74	11	6 0 0		42	11	4 18 6
	69	5	15 16 0		41	1, 6	11 12 6
	59	2	8 10 6	North Treskerby	65	3	4 19 6
	55	3	17 4 0		62	9	3 16 6
	54	13	7 14 0		58	3	5 5 0
	36	3	5 15 6		54	9	3 5 6
	33	3	6 5 6		53	7	5 17 6
Great Wheal Busy ...	81	1, 7	2 4 0		52	3	4 10 6
	73	2, 5, 7	3 8 0	West Caradon.....	68	1	5 12 6
	67	2	2 3 0		56	6	8 5 6
	62	8	3 1 6		55	1, 6	9 4 6
	58	5	3 2 0		52	1	8 0 0
	42	1	1 8 6		48	9	5 5 6
	38	1	3 0 6		36	10	4 8 0
	30	5	1 19 6		19	1	1 8 6
	18	9	4 1 0	Fowey Consols	76	1	7 4 6
	2	1	40 0 0		74	6	6 10 6
Clifford Amalgamated	70	12	2 0 6		70	1, 5	5 6 6
	64	3, 4, 6	4 12 0	Wheal Polmear	62	8, 10	5 13 6
	63	2, 6	4 16 6		46	5	5 8 6
	58	1, 10	1 6 6		37	2	8 7 0
	53	12	1 9 6	Craddock Moor	48	4, 6	5 6 6
	50	12	1 7 6		47	6, 7	5 14 0
	47	10	2 2 6		45	1	0 12 6
	40	2	6 8 6	North Downs	43	3	5 16 0
	17	5	3 16 0		42	7	4 14 6
Phœnix Mines	90	5	3 7 0		40	10	5 12 6
	89	6	3 5 6	Boscawen.....	45	10	2 16 6
	64	1, 8	2 13 6		43	6	3 12 6
	63	10	1 17 0		24	6	9 18 6
	58	5	2 2 6	St. Day United	45	3	0 14 0
	49	1	2 8 6		43	2, 5	4 19 0
	33	9	9 9 6	Gonamena	39	10	6 18 0
Wheal Rose.....	77	4, 6	5 18 6		33	10	2 12 6
	75	4, 6	6 1 6	South Crinnis	31	10	7 1 0
	64	4, 6	6 11 6	Pedn-an-drea	23	6	6 6 0
	59	3	4 9 6	Wheal Kitty	18	6	8 0 0

TOTAL PRODUCE AND VALUE.

	Tons.	Amount.		Tons.	Amount.
South Caradon	471	£5,049 5 6	Craddock Moor	140	£551 12 6
Grent Wheal Busy	471	1,327 17 0	North Downs	125	672 17 0
Clifford Amalgamated ...	462	1,385 7 6	Boscawen	112	521 4 0
Phœnix Mines	446	1,435 9 6	St. Day United	88	244 7 0
Wheal Rose	410	2,645 9 0	Gonamena	72	355 14 6
North Treskerby.....	344	1,588 11 0	South Crinnis.....	31	218 11 0
West Caradon	334	2,207 19 0	Pedn-an-drea	23	144 18 0
Fowey Consols.....	220	1,402 19 0	Wheal Kitty	18	144 0 0
Polmear.....	145	910 7 0			

EACH COMPANY'S PURCHASE.

	Tons.	Amount.		Tons.	Amount.
1 Vivian and Sons	666½	£3,902 7 6	9 Copper Miners' Co.	215	£1,052 15 6
2 Freeman and Co.....	280½	1,554 2 5	10 Charles Lambert	394	1,515 11 6
3 Grenfell and Sons	467½	2,867 4 2	11 Newton, Keates & Co....	116	650 17 0
4 Crown Copper Co.*.....	—	—	12 Sweetland, Tuttle & Co.	173	288 13 6
5 Sims, Willyams & Co....	449½	2,442 16 2	13 Penclawdd Copper Co....	54	415 16 0
6 Williams, Foster & Co.	788½	4,848 9 1			
7 Mason and Elkington...	183½	815 12 2	Total.....	3,912	£20,806 8 6
8 Bankart and Sons	125	452 3 6			

Average Produce, 6½.
Quantity of Fine Copper, 259 tons 17 cwts.

Average Standard £121 9 0
Average Price per ton 5 6 6

* The purchases made by No. 4 (Crown Copper Co.) are included in the tota of No. 6 (Williams, Foster & Co.), those firms being identical.

Copper Ores.

Sampled May 18, and sold at Tyack's Hotel, Camborne, June 2.

Mines	Tons.	Purchasers.	Price.
Clifford Amalgamated	94	8	£4 7 0
	92	1, 7	5 15 0
	83	6	5 8 6
	75	8	5 9 6
	67	9	5 4 6
	66	1	10 10 6
	61	7	4 11 0
	60	8, 10 *	4 6 0
	57	3	10 18 0
	56	2	4 12 6
	41	3	9 17 0
	31	1	3 10 6
	29	9	2 5 0
	25	9	5 2 0
(Consols)	41	2, 6	7 1 6
	32	1	10 4 6
Wheal Seton	30	12	3 7 0
(Pendarves)	161	9, 10	1 1 0
	95	2	5 12 6
	81	1, 6, 10	5 12 6
	63	10	4 2 6
	56	10	4 10 0
	23	1, 6	14 6 6
West Seton	88	7	3 3 6
	66	5, 7, 10	4 5 0
	65	1	9 4 6
	50	3, 7, 10	5 6 0
	48	2, 6, 12	4 8 0
	47	3, 6, 7	5 8 6
	42	5	4 5 6
	37	9	5 19 0
	34	1	1 4 6

Mines.	Tons.	Purchasers.	Price.
West Seton	31	12	£2 16 0
East Pool	65	1	0 3 6
	56	10	2 19 6
	53	7	4 1 0
	50	7, 10	2 10 0
	49	8, 12	4 4 0
Wheal Basset	52	5	4 10 0
	45	5	5 12 0
	28	5	11 3 0
	22	5	13 8 0
South Tolgus	73	2, 3, 7, 9, 10	5 6 6
	68	7	5 1 0
South Frances	37	4, 6, 7	4 14 6
	35	4, 6, 7, 12	4 14 6
	26	2	5 16 0
	24	7	6 7 0
Dolcoath	58	4, 6	4 8 0
	54	3	5 10 0
West Tolgus	95	6	6 8 6
	14	3, 13	4 10 6
East Basset	40	1	10 1 0
	30	10	4 5 0
	20	7	11 0 0
South Crofty	45	9, 12	2 2 6
	26	12	6 5 6
Tincroft	37	12	2 14 6
	13	9	8 0 6
Condurrow	41	10	4 5 6
	6	12	4 8 6
Camborne Vean	17	3	2 4 0
Stray Park	15	13	4 0 0
Michell's Ore	1	5	4 19 0

TOTAL PRODUCE AND VALUE.

	Tons.	Amount.
Clifford Amalgamated	910	£5,582 10 6
Wheal Seton	509	2,100 18 0
West Seton	508	2,770 17 0
East Pool	273	723 8 6
Wheal Basset	147	1,093 0 0
South Tolgus	141	732 2 6
South Frances	122	643 8 0
Dolcoath	112	552 4 0
West Tolgus	109	£673 14 6
East Basset	90	749 10 0
South Crofty	71	258 15 6
Tincroft	50	205 3 0
Condurrow	47	201 16 0
Camborne Vean	17	37 8 0
Stray Park	15	60 0 0
Michell's Ore	1	4 19 0

EACH COMPANY'S PURCHASE.

	Tons.	Amount.
1 Vivian and Sons	390¼	£2,615 0 3
2 Freeman and Co.	228	1,237 7 1
3 Grenfell and Sons	223	1,642 5 10
4 Crown Copper Co.*	—	—
5 Sims, Willyams & Co.	212	1,371 0 0
6 Williams, Foster & Co.	395¾	2,284 0 6
7 Mason and Elkington	475½	2,610 11 8
8 Bankart and Sons	223½	1,051 8 6
9 Copper Miners' Co.	288¾	£1,077 7 6
10 Charles Lambert	462¾	1,668 14 6
11 Newton, Keates & Co.	—	—
12 Sweetland, Tuttle & Co.	201½	740 5 8
13 Penclawdd Copper Co.	22	91 13 6
Total	3,122	£16,389 15 0

Average Produce, 6¼.
Quantity of Fine Copper, 206 tons 5 cwts.

Average Standard £121 2 0
Average Price per ton 5 5 0

* The purchases made by No. 4 (Crown Copper Co.) are included in the total of No. 6 (Williams, Foster & Co.), those firms being identical.

Copper Ores.

Sampled May 25, and sold at Tabb's Hotel, Redruth, June 9.

Mines.	Tons.	Purchasers.	Price.
Carn Brea	67	6, 10	£2 17 0
	62	11	7 0 6
	57	7	4 10 6
	47	9	6 9 6
	40	7, 10	4 17 0
	37	6, 11	3 14 0
	29	7	7 3 6
West Basset	85	1	6 19 6
	78	4, 6	4 4 0
	58	9, 11	5 15 0
	52	5, 6	2 18 0
	36	5	4 6 0
	21	13	6 10 6
Prosper United.....	67	1	1 15 6
	65	7	4 11 0
	64	12	3 5 0
	32	5	5 4 6
	30	7	2 19 0
East Carn Brea	71	2, 6, 7	4 8 6
	65	2, 6, 9	4 9 6
	18	7	6 17 6
Rosewarne Consols ...	59	5	8 7 0
	47	5	6 0 0
	26	1, 2	14 6 6
Great South Tolgus...	63	7	10 11 0
	62	2, 6	7 18 0
Par Consols	90	3	6 15 6
	30	10	3 14 6

Mines.	Tons.	Purchasers.	Price.
Charlotte United.....	44	5	£8 1 6
	39	6	4 11 6
	30	10	5 15 6
Copper Hill	42	1	10 15 6
	37	12	3 11 6
	29	12	3 15 6
Wheal Uny	44	6	5 7 0
	42	9	5 1 0
Rosewarne United ...	45	2	2 16 6
	28	4, 6	7 8 6
West Fowey Consols	70	1, 6	8 7 6
New Rosewarne	68	7, 10	8 4 0
Wheal Anna	45	4, 6	5 3 0
	10	1	3 15 6
West Alfred Consols...	55	12	1 2 6
Pendeen Consols	30	8	2 19 0
	23	12	1 11 6
Wheal Curtis.....	32	5, 10	3 12 6
Gurlyn	26	2	5 11 0
South Dolcoath.....	18	3	12 16 0
Wheal Agar	13	4, 6	4 6 6
South Carn Brea	13	8	5 0 6
West Trevelyan	11	1	7 14 6
West Grylls	5	6	6 2 6
Camborne Consols ...	4	12	3 1 0
New Hendra.....	3	5	6 8 0
Pembroke	2	1	2 9 6

TOTAL PRODUCE AND VALUE.

	Tons.	Amount.
Carn Brea	339	£1,727 14 6
West Basset	330	1,696 12 0
Prosper United.....	258	878 7 6
East Carn Brea.....	154	728 16 0
Rosewarne Consols	132	1,147 2 0
Great South Tolgus..... ...	125	1,154 9 0
Par Consols	120	721 10 0
Charlotte United.....	113	706 19 6
Copper Hill	108	691 6 8
Wheal Uny	86	447 10 0
Rosewarne United	73	335 0 6
West Fowey Consols	70	586 5 0
New Rosewarne	68	557 12 0

	Tons.	Amount.
Wheal Anna.....	55	£269 10 0
West Alfred Consols	55	61 17 6
Pendeen Consols	53	124 14 6
Wheal Curtis	32	116 0 0
Gurlyn	26	144 6 0
South Dolcoath	18	230 8 0
Wheal Agar	13	56 4 6
South Carn Brea	13	65 6 6
West Trevelyan	11	84 19 6
West Wheal Grylls	5	30 12 6
Camborne Consols	4	12 4 0
New Hendra.....	3	19 4 0
Pembroke	2	4 19 0

EACH COMPANY'S PURCHASE.

	Tons.	Amount.
1 Vivian and Sons	265	£1,771 7 6
2 Freeman and Co.	160⅓	904 4 8
3 Grenfell and Sons	108	840 3 0
4 Crown Copper Co.*	—	—
5 Sims, Willyams & Co. ...	263	1,604 11 0
6 Williams, Foster & Co. ...	441⅓	2,246 19 2
7 Mason and Elkington ...	339⅔	2,119 3 6
8 Bankart and Sons	43	153 16 6

	Tons.	Amount.
9 Copper Miners' Co. ...	189⅔	£780 2 8
10 Charles Lambert.....	163⅓	814 5 6
11 Newton, Keates & Co.	109⅓	670 15 0
12 Sweetland, Tuttle & Co.	212	560 1 0
13 Penclawdd Copper Co.	21	137 0 6
Total.....	2,266	£12,602 10 0

Average Produce, 6⅞.
Quantity of Fine Copper, 156 tons 2 cwts.

Average Standard £120 13 0
Average Price per ton 5 11 0

No Sale on June 16th.

* The purchases made by No. 4 (Crown Copper Co.) are included in the total of No. 6 (Williams, Foster & Co.), those firms being identical.

Copper Ores.

Sampled June 8, and sold at the Royal Hotel, Truro, June 23.

Mines.	Tons.	Purchasers.	Price.
Devon Great Consols	137	12	£2 14 0
	134	1	5 14 0
	132	1	6 19 0
	131	5	6 7 0
	128	6	4 18 0
	121	6	5 0 6
	120	6, 10	4 6 0
	118	2	4 11 6
	116	9	3 16 6
	114	10	4 3 6
	113	7	6 9 6
	112	10	3 16 0
	111	7	5 18 0
	109	9	4 15 6
	102	11	6 5 6
	79	10	1 19 0
	56	5	2 1 0
	52	3	15 0 6
	48	1, 2	15 16 6
East Caradon	91	10	4 14 0
	88	6	4 11 6
	84	9	4 10 0
	74	1	7 18 6
	68	6	4 14 6
	54	6	7 12 6

Mines.	Tons.	Purchasers.	Price.
East Caradon	43	1, 5, 6	£15 5 6
Marke Valley	85	12	2 19 6
	84	3	3 6 6
	83	12	2 17 6
	80	3	2 19 0
	50	10	2 10 0
	48	3, 11	6 18 6
Devon & Cornwall ...	103	1	1 6 6
	95	10	2 2 6
	22	11	6 12 0
Bedford United.....	102	3	4 6 6
	98	3	4 6 6
Okel Tor.....	81	3	3 17 6
	75	3	3 13 0
Brookwood	73	5	3 12 0
	44	10	2 1 6
	31	2	9 0 6
Wheal Friendship ...	56	5, 7	10 11 6
	51	6	11 0 6
	40	11	3 5 6
North Wheal Robert	62	13	4 6 6
Wheal Arthur	50	7	2 10 6
Fursdon	41	4, 5, 6	4 4 6
Sortridge Consols.....	35	13	4 1 0
Oliver's Ore	1	5	8 17 0

TOTAL PRODUCE AND VALUE.

	Tons.	Amount.
Devon Great Consols...	2,033	£10,876 2 6
East Caradon	502	3,184 12 6
Marke Valley	430	1,464 4 0
Devon and Cornwall...	220	483 11 0
Bedford United	200	865 0 0
Okel Tor	156	587 12 6
Brookwood	148	633 17 6
Wheal Friendship	147	£1,285 9 6
North Robert	62	268 3 0
Wheal Arthur.....	50	126 5 0
Fursdon	41	173 4 6
Sortridge Consols	35	141 15 0
Oliver's Ore.....	1	8 17 0

EACH COMPANY'S PURCHASE.

	Tons.	Amount.
1 Vivian and Sons	521½	£3,133 17 4
2 Freeman and Co.	173	1,199 8 6
3 Grenfell and Sons	596	2,915 8 6
4 Crown Copper Co.*	—	—
5 Sims, Willyams & Co. ...	317	1,791 1 8
6 Williams, Foster & Co. ...	611¾	3,525 11 6
7 Mason and Elkington ...	302	1,808 18 6
8 Bankart and Sons	—	—
9 Copper Miners' Co.	309	£1,342 3 6
10 Charles Lambert	645	2,159 9 6
11 Newton, Keates & Co....	148	951 9 0
12 Sweetland, Tuttle & Co.	305	861 8 0
13 Penclawdd Copper Co.	97	409 18 0
Total	4,025	£20,093 14 0

Average Produce, 6½.	Average Standard £125 9 0
Quantity of Fine Copper, 248 tons 9 cwts.	Average Price per ton 5 0 0

Blende Sales.

Dates.	Mines.	Tons.	Price per ton. £ s. d.	Purchasers.	Amount of Money. £ s. d.
April 28.	Great Laxey	300	... 3 7 6	... W. Kenrick	1,012 10 0
May 20.	,, ...	300	... 3 10 0	... Vivian & Sons	1,050 0 0
June 3.	Minera	79	... 5 17 6	... ditto	779 2 6
	,, ...	35	... 4 18 0	... H. Southern	
	,, ...	12	... 5 5 0	... Vivian & Sons	
	,, ...	14	... 5 15 0	... ditto	
,, 21.	Great Laxey	300	... 4 0 0	... ditto	1,200 0 0

* The purchases made by No. 4 (Crown Copper Co.) are included in the total of No. 6 (Williams, Foster & Co.), those firms being identical.

Copper Ores.

Sampled May 4, and sold at Swansea, May 24.

Mines.	Tons.	Produce.	Purchasers.	Price.		
Berehaven	104	11¼	7	£9	7	0
	96	11	16	9	0	0
	81	11	7	8	18	0
	119	11½	2	9	1	0
	110	10⅝	6	9	0	6
	60	11	3	9	9	0
	125	10¼	5	8	15	6
Knockmahon	126	5¾	10	4	3	0
	44	9¼	1, 11	8	3	6
	53	10¼	15	9	2	6
	85	12⅝	7	10	8	0
	70	10¼	1	8	10	6
	59	10¼	7	9	1	6
	83	11⅜	2	9	14	0
	56	9¾	16	8	2	0
Gwalla Ore	58	32¼	6	£26	12	0
	37	40½	2, 7	33	15	0
	16	42¼	3	35	15	0
Cape Copper	86	25¼	5, 6	21	5	0
Regulus	5	21½	6	17	0	0
Burnt Ore	111	3½	7	2	2	6
Connorree Ore	77	3½	7	2	1	6
	69	3⅝	7	2	3	0
Ballycummisk	14	17½	6	14	11	0
	20	12¾	11	10	6	0
	43	6	1, 11	4	13	0
Burnt Ore	135	3¼	1	2	0	6
Moonta	48	11½	11	9	4	6
Norwegian Ore	7	29½	5	24	15	0

TOTAL PRODUCE AND VALUE.

	Tons.	Amount.				Tons.	Amount.		
Berehaven	695	£6,290	17	6	Connorree Ore	146	£308	2	6
Knockmahon	576	4,641	2	0	Ballycummisk	77	609	13	0
Gwalla Ore	111	3,363	11	0	Burnt Ore	135	273	7	6
Cape Copper	86	1,827	10	0	Moonta	48	442	16	0
Regulus	5	85	0	0	Norwegian Ore	7	173	5	0
Burnt Ore	111	235	17	6					

EACH COMPANY'S PURCHASE.

	Tons.	Amount.				Tons.	Amount.		
1 Copper Miners' Co.	248½	£1,129	19	0	10 Bankart and Sons	126	£522	18	0
2 Freeman and Co.	220½	2,506	8	6	11 Charles Lambert	111½	928	12	6
3 Grenfell and Sons	76	1,139	0	0	12 Ravenhead Copper Co.	—	—		
4 Crown Copper Co.	—	—			13 Sweetland, Tuttle & Co.	—	—		
5 Sims, Willyams, & Co.	175	2,183	17	6	14 Jennings & Co.	—	—		
6 Vivian and Sons	230	3,738	0	0	15 Penclawdd Copper Co.	53	483	12	6
7 Williams, Foster & Co.	604½	4,281	2	0	16 Mona Copper Co.	152	1,317	12	0
8 British and Foreign	—	—							
9 Mason and Elkington	—	—			Total	1,997	£18,251	2	0

Black Tin Sales.

Dates.	Mines.	Tons.	c.	q.	lbs.	Price per ton. £	s.	d.	Purchasers.	Amount of Money. £	s.	d.
May 7.	Great Wheal Busy	21	15	0	24	—			—	1,156	1	8
,, 18.	Wheal Par	2	11	3	9	65	12	6	Redruth Co.	170	1	4
,, 20.	West Beam	9	12	2	23	63	17	6	Harvey & Co.	615	9	0
,, 21.	North Basset	4	14	2	26	61	5	0	ditto	290	2	4
	Penhalls	6	2	1	5	—			—	394	8	0
	St. Just United	25	1	1	10	—			—	1,594	10	0
,, 26.	Gurlyn	2	15	1	8	61	0	0	Chyandour	168	14	6
,, 28.	North Jane	1	16	3	16	—			Daubuz & Co.	106	1	4
June 1.	St. Day United	45	5	0	4	—			—	2,517	2	6
	Great Wheal Busy	17	0	0	0	—			—	952	14	6
,, 2.	Leeds & St. Aubyn	3	14	0	19	64	7	6	Chyandour	238	13	6
,, 4.	Phœnix	11	17	0	18	55	0	0	Bissoe Co.	652	3	10
,, 8.	Wheal Sidney	4	3	3	10	65	12	6	Carvedras	275	2	0
,, 9.	Pendeen Consols	5	1	1	23	60	0	0	R. Michell & Co.	601	10	3
,,	,,	4	19	0	6	60	0	0	Bolitho & Sons			
,, 14.	Great Wheal Vor United	47	9	2	12	—			—	3,155	3	4
,, 18.	Pedn-an-drea	10	5	0	13	—			Carvedras	622	8	0
	Furze Hill Wood	4	18	1	26	63	2	6	Truro Co.	310	16	6

Copper Ores.

Sampled May 25, and sold at Swansea, June 14.

Mines.	Tons.	Produce.	Purchasers.	Price.
Cobre	104	13¼	7	£10 15 6
	103	13⅜	7	10 17 0
	100	13¼	5, 7	10 16 6
	90	13⅜	6	10 16 0
	81	13	16	10 12 6
	54	24½	5	19 0 6
	16	57½	6	48 0 0
	2	36⅝	5	27 18 0
	57	40	5	31 16 0
	98	13½	2, 7	10 17 6
	30	32	10	25 1 6
	10	9¼	2	7 14 0
Berehaven	120	10⅛	13	8 3 6
	75	10½	9, 16	8 7 6
	100	10⅜	1, 2	8 2 0
	44	10⅛	16	8 6 0
	88	9¾	2, 6, 16	7 15 0
	7	9½	1	7 11 6
	115	10½	9	8 11 6
Knockmahon	52	11⅝	2	9 5 6
	132	11⅝	2, 6, 7	9 5 0
	36	11½	7	9 12 0
	90	12¼	1	9 19 6
	105	5½	5	4 0 6

Mines.	Tons.	Produce.	Purchasers.	Price.
Knockmahon	48	9½	16	£7 15 6
	45	11½	13	8 19 6
Connorree	100	2¼	6	1 17 0
	80	2¼	6	1 17 0
Western Australian	53	15½	6	12 5 0
	49	14¾	6	12 5 0
Spanish Ore	30	¼	—	—
	19	1½	5	0 3 0
	8	6¼	6	3 17 0
Burnt Ore	45	3½	1, 16	2 0 6
British Regulus	37	36½	5	29 3 0
Californian	29	6¼	10	5 0 6
New Cornwall	22	17⅞	6, 11	14 10 0
Dyfngwm	14	12⅝	1	10 2 6
Gourock	9	5½	6	3 15 0
	2	12½	6	10 5 0
Cronebane	15	3½	5	2 3 0
	9	3½	6	1 18 0
Tigrony	11	4	6	2 15 0
Cronebane	2	27½	10	20 2 6
Tigrony	2	27½	10	20 2 6
Cape Ore	3	24½	11	19 5 0
Australian Ore	3	9⅛	10	6 15 6

TOTAL PRODUCE AND VALUE.

	Tons.	Amount.
Cobre	745	£1,712 0 6
Berehaven	549	4,505 9 6
Knockmahon	508	4,146 7 0
Connorree	180	333 0 0
Western Australian	102	1,249 10 0
Spanish Ore	57	33 13 0
Burnt Ore	45	91 2 6
British Regulus	37	1,078 11 0
Californian	29	145 14 6
New Cornwall	22	£319 0 0
Dyfngwm	14	141 15 0
Gourock	11	64 5 0
Cronebane	24	49 7 0
Tigrony	11	30 5 0
Cronebane	2	40 5 0
Tigrony	2	40 5 0
Cape Ore	3	57 15 0
Australian Ore	3	20 6 6

EACH COMPANY'S PURCHASE.

	Tons.	Amount.
1 Copper Miners' Co.	183¼	£1,543 1 9
2 Freeman and Co.	234⅛	2,129 15 2
3 Grenfell and Sons	—	—
4 Crown Copper Co.	—	—
5 Sims, Willyams & Co.	339	4,971 5 6
6 Vivian and Sons	511⅛	4,246 19 8
7 Williams, Foster & Co.	386	4,063 2 6
8 British and For. Copper Co.	—	—
9 Mason and Elkington	152½	1,306 3 9
10 Bankart and Sons	66	£998 16 0
11 Charles Lambert	14	217 5 0
12 Ravenhead Copper Co.	—	—
13 Sweetland, Tuttle & Co.	165	1,384 17 6
14 Jennings & Co.	—	—
15 Penclawdd Copper Co.	—	—
16 Mona Copper Co.	262½	2,185 19 8
Total	2,344	£23,048 11 6

Sundry Copper Ore Sales.

Dates.	Mines.	Tons.	Price per ton. £ s. d.	Purchasers.	Amount of Money. £ s. d.
May 28.	Great Laxey	55	5 4 0	Sims, Willyams & Co.	858 0 0
	,,	55	5 4 0	St. Helen's Co.	
	,,	55	5 4 0	Newton, Keates & Co.	
June 6.	Knockmahon (ex Sea Bird)	84	4 8 6	J. Radley	371 14 0
,, 13.	,, ,,	84	4 8 0	Newton, Keates & Co.	
	Lot 1 (ex Augusta)	7	10 8 6	ditto	2,404 11 6
	2 (ex Egyptian)	60	7 8 6	J. Keys & Son	
	3 (ex Meanda)	29	8 6 6	ditto	
	,,	29	8 6 6	St. Helen's Co.	
	4 ,,	56	7 12 6	J. Keys & Son	
	5 (ex Betty)	38	7 12 6	ditto	
	6 ,,	34	7 7 6	ditto	
	7 (ex British Queen)	54	7 12 6	ditto	
,, 21.	Parys	150	6 3 6	Mona Co.	1,235 0 0
	,,	75	6 3 6	Newton, Keates & Co.	
	,,	75	6 3 6	J. Radley	

Lead Ore Sales.

Dates.	Mines.	Tons.	Price per Ton. £ s. d.	Purchasers.	Amount of Money. £ s. d.
May 16.	Bronfloyd	30	15 2 0	A. Eyton	453 0 0
,, 24.	Bromlow	10	14 7 6	ditto	143 15 0
,, 26.	Mount Pleasant	5	13 13 0	Walker, Parker & Co.	68 5 0
	Hendre Ucha	8	15 0 0	ditto	120 0 0
	Bryngwyn	18	15 2 6	ditto	272 5 0
	Pant-y-Mwyn	12	13 7 0	Newton, Keates & Co.	160 4 0
	East Pant Du	8	14 0 0	ditto	112 0 0
	Summer Hill	6	14 18 6	ditto	122 11 0
	,,	3	11 0 0	Brymbo Co.	
	Dyfngwm	13	14 7 6	Walker, Parker & Co.	186 17 6
	Llanerchyraur	22	15 2 6	ditto	332 15 0
,, 27.	Cargoll	60	18 3 6	J. & S. Williams	1,090 10 0
,, 28.	Newton	5	14 18 6	Sims, Willyams & Co.	74 12 6
,, 30.	East Logylas	70	14 13 0	Mining Co. of Ireland	1,025 10 0
	Glogfach	65	18 11 6	ditto	1,207 7 6
	Cwmystwith	100	14 11 0	Sims, Willyams & Co.	1,455 0 0
	Silver Mountain	19½	14 11 0	ditto	284 2 6
,, 31.	Maesysafn	140	15 1 0	ditto	2,107 0 0
June 1.	Dyliffe	48	14 16 6	Walker, Parker & Co.	1,362 16 0
	,,	44	14 16 0	Brymbo Co.	
,, 3.	Minera	100	15 1 6	Walker, Parker & Co.	
	,,	100	15 1 6	ditto	
	,,	100	15 1 6	ditto	
	,,	48	15 1 6	ditto	
	,,	100	14 18 6	Brymbo Co.	8,185 13 6
	,,	63	14 19 6	ditto	
	,,	28	15 3 6	Walker, Parker & Co.	
	,,	6	13 2 6	Newton, Keates & Co.	
,, 4.	Wheal Mary Ann	45	30 2 6	R. Michell & Son	1,918 17 6
	,,	30	18 15 6	ditto	
,, 7.	Great Laxey	100	25 10 6	Sims, Willyams & Co.	2,550 0 0
,, 9.	Talargoch (Maesyrerwddu)	31¼	15 13 6	A. Eyton	2,275 17 6
	,, (Coetia Llys)	108¼	16 8 6	Walker, Parker & Co.	
	Deep Level	10	14 8 0	ditto	144 0 0
	Brynford Hall	8	14 12 6	ditto	117 0 0
	Parry's	17	14 14 6	ditto	250 6 0
	Bryn Gwiog	35	15 9 6	A. Eyton	541 12 6
	Long Rake	25	14 19 0	ditto	373 15 0
	Speedwell	5	14 1 0	Walker, Parker & Co.	70 5 0
	Merllyn	3	14 3 0	Newton, Keates & Co.	42 9 0
	Pennant	11	14 9 6	Walker, Parker & Co.	159 4 6
	North Henblas	30	14 5 0	A. Eyton	427 10 0
	Dog Pit	13	13 14 6	Walker, Parker & Co.	178 8 6
	Pantne	6	14 10 6	ditto	87 3 0
	Penyclyn	30	14 18 6	ditto	447 15 0
	Roman Gravels	23	14 12 6	ditto	336 7 6
	Pool Park	20	15 12 6	ditto	312 10 0
	Llangynog United	9½	14 4 6	ditto	135 2 9
	Caeconroy	5½	15 4 6	A. Eyton	79 18 7½
	Dyfngwm	12½	14 5 0	Walker, Parker & Co.	178 2 6
,, 13.	Frongoch	70	14 4 0	Sims, Willyams & Co.	994 0 0
	,,	70	14 2 0	Walker, Parker & Co.	
	East Darren	80	17 9 6	Stock & Co.	1,398 0 0
	Goginan	18	18 2 6	Panther Co.	
	,,	7	19 5 6	ditto	628 3 6
	,,	11	13 0 0	ditto	
	Cwm Erfin	35	18 8 6	ditto	1,180 7 6
	,,	30	17 9 0	Walker, Parker & Co.	
,, 18.	Dyliffe	60	14 18 6	A. Eyton	895 10 0
,, 21.	Wheal Frank Mills	90	14 6 0	R. Michell & Son	1,287 0 0
,, 23.	Westminster	28	14 6 0	Brymbo Co.	400 8 0
	Hendre Ucha	6	14 7 0	Newton, Keates & Co.	86 2 0
	Bryngwyn	8	14 12 6	ditto	234 0 0
	,,	8	14 12 6	Walker, Parker & Co.	
	Dyfngwm	11	14 3 6	Newton, Keates & Co.	155 18 6
	Llanerchyraur	6	14 10 0	Brymbo Co.	87 0 0

THE

MINING AND SMELTING MAGAZINE.

AUGUST, 1864.

The Metallurgical Processes of the Mansfeld Copper Works.

By Albrecht von Groddeck, Metallurgical Engineer, of Stolberg, near Aix-la-Chapelle.*

(*Continued from page* 9.)

II. Summary Review of the Smelting Processes.

From what has already been stated it will have been seen that the ordinary Mansfeld ores, or "work," contain copper, silver, and nickel in sufficient quantities to be treated remuneratively; and that, besides the ordinary "work," certain nickeliferous ores (copper-nickel) are raised. The objects of the metallurgical processes to be described are the separating and obtaining of the metals named:—1stly, from the ordinary ores, and 2ndly, from the nickeliferous ores which have to undergo a special treatment. The subject may be conveniently classed under the four following sections:—

§ 1. Treatment of the ordinary ores or "work."
§ 2. Treatment of the nickliferous ores.
§ 3. Résumé, and economical results.
§ 4. Comparison of the Mansfeld with other metallurgical processes.

§ 1. *Treatment of the Ordinary Ores or "Work."*

We may class the metallurgial treatment which these ores receive under the three following processes:

* Abstracted from the *Berg- und Hütten. Zeit.*, Nos. 8, 11, 17, 23, 27, &c., 1864. The order, in one or two places, is slightly altered for the convenience of English readers.—Ed. M. & S. M.

a. Raw smelting operations (*Rohprozesse*) to obtain a regulus.

b. Extraction of the silver from this regulus, and fusion and refining of the copper.

c. Treatment of the refinery-residua for black (nickel) vitriol.

The object of the first process (*Rohprozesse*) is the production from the low-produce ores described of a regulus, called concentration-regulus, which contains from 65% to 69% of copper, and is ready for desilverisation. As in this process about 90% of the weight of the ores has to be slagged off, it is evident that they cannot profitably bear any lengthened carriage before smelting; which necessitates and justifies the fact that they are treated at works near the mines but far apart from each other. The concentration-regulus produced by this raw smelting process at these various works, can, on the other hand, be most profitably treated in the two stages of the second process—that of desilverisation, and that of getting and refining the metallic copper—at some one establishment for each distinct process; since the obvious advantage of concentrating such operations more than compensates for the extra cost of carriage on a highly enriched product. The desilverisation, consequently, is effected entirely at the Gottesbelohnungshütte, where the desilverised residues are also smelted for black copper; and this black copper is refined, either by the ordinary method in a reverberatory furnace or in the small hearth at the Saigerhütte about half a mile off. In the third and final process, the refinery-residua are treated until they contain about 20% of Ni, from which black (nickel) vitriol is manufactured.

This series of processes has remained without change since 1831, when the old refining (*Saiger**) method was abandoned and the desilverisation of the copper regulus introduced.

a. Raw Smelting:

For the purpose of concentrating the metallic contents of the Mansfeld ores, the dry method has had to be adopted, as the high percentage of lime they contain precludes the adoption of any wet process, on account of the great consumption of acids that would be necessary under any present conditions of metallurgical knowledge. The dry method is also recommended by the fact that the slag-producing constituents are found in the ores nearly in the proportions required for smelting. It has been found from experience, the particulars of which will be referred to more fully further on, that these ores cannot be smelted in reverberatory furnaces; so they are always treated in blast-furnaces from which ore-furnace regulus is obtained. The use of the blast-furnace, however, necessitates the previous getting rid of the bituminous constituents of the ores, which is done in the first part of the process.

1. *Roasting of the Schist.*—This is done by burning it in heaps in the open air; after which follows the second part of the process.

* By the old *Saiger* method the silver was separated from the black-copper (and not from the regulus) by the process of liquation.—Ed. M. & S. M.

2. *Fusion of the Roasted Ore.*—This is effected in a kind of blast-furnace, from 13′ to 20′ high, called a *Brillenofen*, with the addition of fluor spar and concentration-slag. The principal products of this stage of the process are—slags, containing about 0·85% of copper, which mostly go to the waste-heaps, and ore-furnace regulus (*Rohstein*), containing from 22% to 33% of copper, which is ready for treatment at the third stage of the process.

3. *Roasting of the Ore-furnace Regulus.*—As the ore-furnace regulus obtained in the last stage cannot with advantage be subjected to the process of desilverisation, it is put through another process of concentration. To effect this it has to be first roasted; which was formerly done in open heaps, or in sheds, but is at present carried out in kilns in order that the SO^3 may be utilised in the manufacture of sulphuric acid. The gain in thus collecting the SO^3 is not so much in the value of the sulphuric acid made from it, as in the fact that by this means the sulphurous acid gas, so deleterious to vegetation, is prevented from escaping. Indeed the conditions of the concession of the Eckardthütte from Sept. 27, 1857, expressly stipulate that this roasting shall only be carried on in closed kilns, and that the fumes evolved shall be condensed in closed chambers. This roasted ore-furnace regulus is now submitted to the fourth and last stage of the process.

4. *Fusion of the Roasted Ore-furnace Regulus.*—This roasted regulus used formerly to be concentrated like the roasted schist by fusion in a blast-furnace. In the use of this kind of furnace, the occasional accidental formation of black-copper is well-known to be unavoidable; but under the old refining (*Saiger*) method this was not found seriously to interfere with the working. Since, however, this Saiger method was replaced, in 1831, by the new desilverising processes—in which the black-copper cannot be desilverised in the regular course of working—this accidental formation of black-copper became very troublesome. This was the principal reason which led to the substitution of the reverberatory furnace in this stage of the process—as with this furnace an accidental formation of black copper can with ease be entirely avoided. But besides this, there were other important reasons in favour of the alteration: (1) the cheap Riestädt lignite could be employed in the reverberatory furnace; (2) the quantities smelted could be increased, inasmuch as the water power formerly required for blowing the blast-furnaces at this stage became available for working additional furnaces at the second stage (fusion of the roasted ore); and (3) the reverberatory furnace allowed of "trials" being from time to time taken, from which the exact nature of the concentration-regulus could be ascertained, and consequently regulated to the proportions of copper and sulphur most suitable for the preliminary roasting stage of the subsequent desilverising process—which could not be so accurately regulated in a blast-furnace. The principal objection to the use of the reverberatory furnace, which is that the resulting slags are very rich in copper (they contain 8%), has no force whatever with the Mansfeld processes, in which such slags can be advantageously worked up in the raw smelting.

For these reasons, the ore-furnace regulus is now exclusively

concentrated in reverberatory furnaces, with the addition of quartz sand, poor sand-ores, or ore-furnace slag. The product of this last stage of the process of raw smelting is the "concentration-regulus," containing from 65% to 69% of copper.

b. EXTRACTION OF SILVER, AND REFINING COPPER:

1. *Extraction of the Silver.*—As stated, since 1831 the silver has been extracted from the regulus instead of from the metal (black copper) as was the case up to that time. In that year the old Saiger was replaced by the amalgamation method; but this was soon abandoned for Augustin's process, which in turn is now superseded by Ziervogel's method of extracting the silver. In all of these three processes, the concentration-regulus, which consists essentially of FeS,CuS and AgS, has to be roasted until these sulphides are converted into $FeO,SO^3 + CuO,SO^3$ and AgO,SO^3. A perfectly satisfactory conversion of the sulphides into these salts can, however, only be effected where the concentration-regulus contains the proper proportion of sulphur—neither too much nor too little. For the copper percentage stated, the regulus contains, as a matter of fact, the necessary proportion of sulphur required for roasting; but still it has to be finely pulverised, and requires to be very carefully treated. To effect this pulverisation it is tapped into water directly from the reverberatory furnace, and after being thus granulated it can be easily ground to fine powder in mills, which powder is afterwards well roasted in a double-bedded reverberatory furnace. This roasted powder—which consists of the sulphates $FeO,SO^3 + CuO,SO^3$ and AgO,SO^3—is now, in all three methods, decomposed at a very high temperature, resulting in the formation of Fe^2O^3,CuO and AgO,SO^3; the completeness of the conversion being ascertained by trying samples.

In both the old methods, at this stage the AgO,SO^3 was converted, by the admixture of NaCl, into AgCl. In the amalgamation process this AgCl was precipitated by metallic iron, and the Ag extracted from the precipitate by mercury, from which it was finally separated by distillation. In Augustin's process, the AgCl was dissolved in a solution of common salt, and the silver precipitated by copper, from which it is obvious how much superior, both in regard to the time and materials consumed in the operation, this method must have been to the amalgamation process. A further comparison, however, will show how much superior to both of these old methods is that of Ziervogel's, at present in use, in which the AgO,SO^3 is dissolved in acidulated water, and the silver precipitated from this solution by copper.

But an essential condition of Ziervogel's process is that the regulus shall contain little or no As or Sb, for otherwise during the roasting, besides AgO,SO^3, arsenical and antimonial silver-salts (which are insoluble in water) would be formed. This condition obtains in the case of the Mansfeld concentration-regulus, in contrast with most other copper regulus, especially that of the Upper and Lower Harz.

The silver precipitate is first washed to get rid of any particles of copper or salts that may be adhering, and is then refined. Under

the present system of working, the desilverised residues—consisting essentially of FeO,Fe^2O^3, and CuO—are never found to contain more than half-an-ounce of silver per centner (·0027% Ag).

2. *Smelting for Black Copper.*—The desilverised regulus is now converted into black copper by simply smelting in a blast-furnace. As, however, it is in a pulverulent form, it has to be previously kneaded into balls with about 8% of clay and some finely powdered roasted thin-regulus (*Dünnstein*). After being dried, these balls are smelted in blast-furnaces (18¾′ high, and of the kind already mentioned as a *Brillenofen*), with the addition of unroasted thin-regulus. This smelting produces both poor and rich slags—the former going to the waste-heaps, and the latter being subsequently re-smelted. Of the products obtained in this smelting—black copper and thin-regulus—the latter is invariably again mixed with the charge, while the former is conveyed to the Saigerhütte to be refined in the small hearth, or by the ordinary process in reverberatory furnaces.

3. *Refining Processes.*—The refining of the black copper of the Mansfeld district continues still to be generally carried out (*Gaarmachen*) in the small hearth, in which, owing to the purity of the black copper, a peculiar metal (in characteristic thin discs) is obtained, forming the "rosette copper" of commerce, for which there is such a large demand on the continent. By refining in the reverberatory furnace (*Raffiniren*) malleable copper of an equally peculiar excellence is obtained at a smaller cost than with the small hearth. As the Mansfeld works extend their operations, this method is coming into increased use; at present, however, the two reverberatory refining furnaces (*Raffinirŏfen*) at the Saigerhütte are only occasionally in operation, from a deficiency in the supply of copper.

c. TREATMENT OF REFINERY RESIDUA:

1. *Refining and Granulating of the Residua.*—The residua from the refining (in the small hearth, or by the ordinary process) are smelted in a *sumpfofen*, with the addition of ore-furnace slag and fluor spar. The resulting products are refinery-slag No. 1, and poor slag. The latter is cast into blocks for building purposes, and the former, in consequence of its impurities, has to be again smelted in a small hearth before refining; after which it becomes refinery-slag No. 2. It is intended to carry out this operation in a refining furnace (*Spleissofen*) with coal as a fuel, but this arrangement has not yet been brought into operation. This smelted refinery-slag No. 2 is next refined, and the resulting residua again smelted, which, after refining like No. 1, become refinery-slag No. 3, which is the final product treated for obtaining black (nickel) vitriol. It is granulated in water in order to facilitate its ultimate solution.

2. *Treatment of the Granulated Refinery-slag for Vitriol.*—This granulated refinery-slag, which consists essentially of copper, nickel, and lead, is dissolved in SO^3, the lead remaining behind as lead slimes. On the first evaporation the solution only yields copper-vitriol; but ultimately, by various crystallisations, black (nickel) vitriol of various qualities is obtained. Endeavours are now being

made to obtain metallic nickel for *Argentan* (german silver) from this nickel-vitriol, but as yet without success as far as obtaining a metal free from sulphur.

§ 2. *Treatment of the Nickeliferous Ores.*

At the Sangerhäuserhütte copper-nickel is smelted to nickel-speise* in a low blast-furnace (*krummofen*) with charcoal for a fuel. The speise made is at present sold, since the actual production is too trifling to make it worth while to subject it to a further treatment, and the continuance of mining operations in the Sangerhausen district (which produces the nickeliferous ores) is under consideration.

§ 3. *Résumé, and Economical Results.*

From this summary review of the processes by which their metallic contents have been extracted from the Mansfeld ores since 1831, it will be seen that the most essential improvements made have been:—

a. In concentrating the roasted ore-furnace regulus in reverberatory furnaces instead of in blast-furnaces;

b. In the adoption of Ziervogel's method of extracting the silver; and,

c. In the introduction of refining in the ordinary manner (in reverberatory furnaces); the general aggregate result of which has been to reduce to a *minimum* the formation of intermediate products.

The economical results will be best judged of by the following particulars of the absolute cost of the various stages of the processes taken from the books of the respective years.

For the year 1846:—

	Per Centner of Cu.			Per Cwt. of Cu.		
Average cost of—	Thlr.	Sgr.	Pf.	£	s.	d.
Raw-smelting	37	19	1	5	13	0
Amalgamating	4	27	6	0	14	8
Refining { in the small hearth	1	14	1	0	4	6
Refining { in reverberatory furnaces ..	1	7	11	0	3	9

For the year 1849:—

	Per Centner of Cu.			Per Cwt. of Cu.		
Average cost of—	Thlr.	Sgr.	Pf.	£	s.	d.
Raw-smelting	36	10	1	5	9	0
Treatment by salt solution	4	10	11	0	13	0
Refining { in the small hearth	1	12	2	0	4	4
Refining { in reverberatory furnaces ..	1	9	1	0	3	10

* The word *speise* is used by the Germans as a generic appellation for the arsenides of any metal, as *regulus* is for the sulphides by us. As there is no one English word of a similar meaning, it is convenient to adopt the word speise, for which besides we have the authority of Dr. Percy.—ED. M. & S. M.

For the year 1852:—

	Per Centner of Cu.			Per Cwt. of Cu.		
Average cost of—	Thlr.	Sgr.	Pf.	£	s.	d.
Raw-smelting	35	5	6	5	5	6
Treatment by acid solution	3	14	5	0	10	5
Refining { in the small hearth	1	1	1	0	3	0
Refining { in reverberatory furnaces ..	0	28	6	0	2	10

For the year 1855:—

	Per Centner of Cu.			Per Cwt. of Cu.		
Average cost of—	Thlr.	Sgr.	Pf.	£	s.	d.
Raw-smelting	28	28	8	4	6	10
Treatment by acid solution	2	6	8	0	6	8
Refining { in the small hearth	0	27	11	0	2	9
Refining { in reverberatory furnaces ..	0	26	10	0	2	8

For the year 1858:—

	Per Centner of Cu.			Per Cwt. of Cu.		
Average cost of—	Thlr.	Sgr.	Pf.	£	s.	d.
Raw-smelting	33	16	11	5	0	6
Treatment by acid solution and refining..	2	22	3	0	8	0

For the year 1860:—

	Per Centner of Cu.			Per Cwt. of Cu.		
Average cost of—	Thlr.	Sgr.	Pf.	£	s.	d.
Raw-smelting	33	6	9	4	19	8
At the Gottesbelohnungshütte	1	23	7	0	5	0
Refining in the small hearth	0	27	5	0	2	6

§ 4. *Comparison of the Mansfeld with other Metallurgical Processes.*

On comparing the Mansfeld processes for extracting copper and silver with those pursued in the Upper and Lower Harz districts, it is obvious that the variations in the metallurgical methods arise from the different nature of the ores to be treated, and are not due to mere local usage. The most important distinction between the ores of these districts is the great variation in the relative proportions of arsenic, antimony, and silicic acid they contain in respect of the earthy constituents. While the ores of the Upper Harz district can be "dressed," such is not the case either in the Lower Harz or the Mansfeld districts, in consequence of the large intermixture of other sulphides in proportion to the earthy matters. Still however the copper-pyrites ore of the Upper Harz is so far similar to that of the Lower Harz, that in both sulphides predominate; while the case is quite different with the Mansfeld ores, of which earths (silica and lime) are the characteristic constituents.

The treatment of the Mansfeld ores, therefore, in the earlier processes shows but little analogy to the processes of the Upper or Lower Harz. The roasting of the schist cannot be considered as a process analogous to the calcination of the copper ores of the Harz; for while, in the schist, the oxidation of the sulphides is as much as possible avoided, such an oxidation is the main object of the calcination of the ores. The raw smelting also of the Harz is a totally distinct metallurgical process from that known by the same name at Mansfeld. In both the Harz districts it is a reducing-smelting process, variously conducted according to the proportions of iron, antimony, and arsenic contained in the ores, and furnishing correspondingly various products; so that in those two districts the process can be closely compared—a comparison, however, which it would be irrelevant to discuss here. The raw smelting in the Mansfeld district, on the other hand, is a purely melting process, for the earths only are slagged off, and the sulphides merely reduced to fusion. Thus, while in the Harz districts both the construction of the furnace and the composition of the charge are varied so as to attain a temperature most suitable, according to the nature of the ores, to effect this reducing-smelting; in Mansfeld the only object is to get as high a temperature as attainable, so as to slag off the earths as quickly as possible. This is best effected in a furnace on the principle of an iron blast-furnace, worked with hot air; from which a refinery-slag (bi- to tri- silicate) is obtained, which operates so favourably on the duration of the smelting-process. In the Upper and Lower Harz, however, an easily-fusible fresh slag (singulo- to bi- silicate) is produced.

In all these processes the product is ore-furnace regulus, but this is of very varying quality, according to the nature of the ores smelted.

1. The Mansfeld ore-furnace regulus contains silver in extracticable quantities, but only little As or Sb;

2. The ore-furnace regulus resulting from the treatment of the copper pyrites of the Upper Harz, contains little Ag, As, or Sb;

3. The copper regulus from the treating the copper residua of the latter district (the Upper Harz) contains silver in extracticable quantities, as well as notable quantities of As and Sb;

4. The ore-furnace regulus of the Lower Harz contains little silver but much As and Sb. During the process of raw smelting, the silver in the ores has mostly gone into the so-called *Königskupfer*—a speise-like product which cannot be formed either in the Upper Harz or in Mansfeld, in consequence of the inadequate quantities of As and Sb contained in the ores of those districts. The treatment of Nos. 1 and 3 may be compared, as both contain extracticable quantities of silver. But the refinery regulus of the Upper Harz cannot, like the Mansfeld regulus, be treated by Ziervogel's desilverising process, on account of the quantity of As and Sb it contains. Local considerations and the trifling production have necessitated its treatment by the old Saiger process, after previous concentration in blast-furnaces. The refining of the black copper, by treating it with sulphuric acid, as at Oker, is very shortly to be restored at the Altenauer silver works.

In the same manner the desilverising of the *Königskupfer* of the Lower Harz by melting, granulating, and dissolving the granulated metal in SO^3, cannot be compared with the Mansfeld desilverising process; it is, however, very similar to the treatment of the renfiery residua at the latter locality, from which indeed the Lower Harz process had its origin.

The desilverised black copper is treated much the same in all three districts, being, in each, refined in the small hearth, except the impure sorts which are melted in a refinery furnace (*Spleissofen*)—such as the *Kienstöcke* of the Upper Harz and the *Rohrostschwarzkupfer* of the Lower Harz. The small production in the Harz districts does not allow of refining in reverberatory furnaces.

(*To be continued.*)

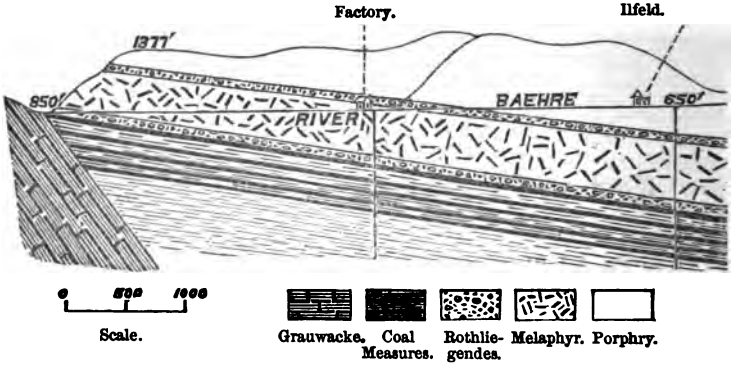
Coal on the Southern Flank of the Harz.

Herr Fr. Ad. Roemer, of Clausthal, has called attention to the probable development of a new coal field on the southern flank of the Harz. Prof. Naumann, of Leipzig, was the first to suggest that the melaphyres and porphyries of the Ilfeld district, like those at Zwickau, form regular bands among the Rothtodtliegende (a member of the Permian formation) and have the Coal-measures extending all the way under them from their outcrop. There do not appear to be any objections to this view; but its confirmation, and the probable discovery of a valuable coal district at Ilfeld, can only be arrived at by borings. In the Zwickau district it has been necessary, in order to reach the coal, to sink through—(1) 1,200′ of Rothtodtliegende, (2) 440′ of porphyries, and (3) 176′ of sandstones and conglomerates. Under these latter—lying among 456′ of sandstones, conglomerates, and clay-slates—four good seams of coal are met with, the aggregate thickness of which amounts to about 50′. The mode of occurrence of the coal formation at Zwickau is very similar to that at Mannsbach, Löbejün, Wettin, and Ilfeld; and from their fossil flora, it would appear that the seam now being worked at Ilfeld is of the same age as the uppermost of the seams at Zwickau, known as the Scherben Seam. It is probable, indeed, that the coal in the Ilfeld district occurs as shown in the accompanying sketch. Fig. 5.

From this it would appear that the productive Coal-measures lie unconformably on the older Grauwacke rocks, which explains the circumstance that, in the Brandesthal and elsewhere, only the Scherben Seam crops out—the other seams worked at Zwickau, or the seams corresponding to them, lying further south at a greater depth. It also shows us that to the south of Ilfeld there will not be 1,200′ of Rothodtliegende to sink through as at Zwickau, since being already a considerable way in the porphyry formation, the coal can be reached, by boring, at a comparatively moderate depth. It is

assumed in the sketch that the Coal-measures have a regular dip of 10° south; but at a distance from the Grauwacke rocks the dip may become less. It is not improbable that the upper coal seam may be reached at a depth of 400′, at the Parquet factory in the Bähre valley; and at a depth of 1000′, just below Ilfeld. Further south the Coal-measures lie deeper, but at some future day pits may perhaps be sunk at Nordhausen itself. There can be little doubt that all the beds will be found to be thicker, and to yield coal of a better quality, than has been found to be the case at the outcrop.

N. FIG. 5. S.



From these facts it may not unreasonably be expected that productive coal mining operations may be established on the southern flank of the Harz. As this district lies about half way between the coal fields of Saxony and Westphalia, such a result would be an incalculable benefit to a wide extent of country. The operations would not require any greater capital than should be readily available in a town like Nordhausen, the Hanoverian Minister of Trade and Finance having decided on abandoning the exploration and working of this coal field to private industry.

Abstracts and Reviews.

IRON CYLINDRICAL AMALGAMATOR.

Mr. Howlands, of San Francisco, has invented an amalgamator, which consists of a stationary cast-iron cylinder, in which the pulp is placed, and within which several arms, or stirrers, are caused to revolve. Two or three sets of arms are affixed to the revolving shaft; the two being so arranged that the second set, as it comes around, strikes the pulp in a separate place from that occupied by the previous one, thus ensuring a thorough and complete agitation of the entire mass. The principle upon which this machine works is the same as that of the Frieberg barrel. In the latter, pieces of soft or wrought iron are placed loosely with the pulp, and the cylinder or barrel is made to revolve, thus producing the necessary

agitation. In this machine the cylinder is stationary, and the agitation is effected by the arms, which are made of wrought iron, in addition to which a bar of wrought iron is also bolted to the top of the interior circumference of the cylinder. The chemical action is, of course, the same in both. The machine is discharged through a convenient opening at the bottom.

This machine undoubtedly possesses many advantages over the Frieberg barrel in point of economy, both in time and wear. It is stated that the cylindrical amalgamator will accomplish its work in a quarter of the time required by the barrel, and at a much less expense of power. The original cost of the cylinder is very little more than that of the barrel, when placed in its frame ready to receive power. The cost for wear and tear in the iron cylinder is also much less than in the barrel.

The chemistry of the process may be stated as follows:—The ore being roasted with common salt has all its silver, copper, lead, and antimony converted into metallic chlorides. These chlorides are, in turn, converted into the metallic state by the action of the iron—the iron itself becoming chloride. The copper, by the wasting, is converted into the bi-chloride, and subsequently, by the action of the iron, partly into the proto-chloride of copper, and partly into the metallic state, which latter portion of the copper precipitates the silver in a metallic form. If the mercury is present in sufficient quantity, all the silver, lead, antimony, and copper is taken up in the form of an amalgam. If sufficient iron has not been added, or if it has not been worked with the ore long enough to convert the bi-chloride into proto-chloride of copper, before adding the mercury, a loss of mercury will take place, because it will act on the undecomposed chloride and become calomel. The heat engendered in the process is due partly to the chemical action going on in the mass, and partly to the friction which is produced.

NOTES ON SPECTRUM ANALYSIS.

The last (July) number of the *Dublin Quarterly Journal of Science** contains a short paper on Spectrum Analysis, read by Mr. Emerson Reynolds, in January last, before the Royal Dublin Society, which contains several valuable suggestions, particularly with regard to the application of this system of analysis to the examination of minerals.

With regard to the Spectroscope used, Mr. Reynolds considers the best instrument to be that constructed with two prisms only, as a larger number obstruct too great an amount of light, and make the extent of the Spectrum inconveniently large—which is particularly the case with hollow prisms filled with bisulphate of carbon, the dispersive power of which is so much greater than glass.

Although the flame of Bunsen's burner is the source of heat generally employed in spectrum observations, Mr. Reynolds has always found the

* We take the present opportunity of drawing our readers' attention to this excellent periodical, which contains a selection of papers read before the Royal Dublin Society, the Royal Irish Academy, the Geological Society of Dublin, and the Natural History Society of Dublin, the whole edited by the Rev. Prof. Haughton, F.R.S., Professor of Geology in the University of Dublin. The Journal is printed at the joint expense of the Societies above named, and published by Messrs. Williams and Norgate, the price to subscribers being ten shillings per annum. The collection of the choice papers read before several societies into one Quarterly Journal is evidently a happy idea, and one, indeed, that might be usefully imitated elsewhere. The numbers of the Journal that have already appeared do credit to the learning and good taste of the Dublin Societies, and the judgment of the Editor. We strongly recommend it to our readers, for we are assured it only requires to be known to be found a welcome addition to any gentleman's library table.

simple hydrogen flame much superior for general use, on account of its more intense action and the increased brilliancy of the spectra observed. In examining mixtures of salts, which become basic when strongly heated (such as chloride of calcium), he found it useful to pass the hydrogen over pure concentrated hydrochloric acid. The best jet that can be used for the hydrogen flame is the shank of a common tobacco pipe, as all other jets impart, at intervals, a colour to the flame. The zinc used in evolving the hydrogen need not be perfectly pure, as a small quantity of arsenic does not interfere with the spectrum reactions. For obtaining brilliant and intense spectra, the spark obtained between the secondary wires of a powerful induction coil is, however, far superior to all other methods, not only for the alkalies and alkaline earths, but for most of the heavy metals and of the gases. But its application to general work, however desirable, is practically inconvenient.

As to the nomenclature of the lines of the spectra, the general practice has been to take one line, such as that of sodium, as a starting point, and to express the distance on either side of it in millimètres. For this practice, which is obviously faulty, Mr. Reynolds has long substituted a means by which a distinct measure of the whole spectrum is obtained, which consists in taking two well defined lines, and dividing the distance between them into 100 parts—above and below which the scale can be continued. The lines he uses are the Li α of the lithium, and the Sr δ of the strontium spectrum, which were selected in consequence of their brilliancy and sharpness of outline, and because the distance between them is of sufficient extent, in ordinary instruments, to admit of accurate graduation. Li α in the zero of the scale, and Sr δ corresponds to the 100th division; and all lines occurring below the zero are represented with the minus sign affixed, as in the notation of the centigrade thermometer. Of course the absolute measurements on this, as on any scale, vary with the dispersive power of the prisms; but by adopting it a simpler and more systematic nomenclature than hitherto used might be given to the lines.

On the application of spectrum analysis to the examination of minerals, Mr. Reynolds has obtained very important results, which, as the subject is one that probably interests many of our readers, we give *in extenso*:—

"It is well known that the spectrum afforded by a solid in a state of ignition is continuous; but that of a luminous, and consequently ignited gas, consists of certain maxima of light separated by intervals of actual or comparative darkness. Since almost every elementary body furnishes bright bands in its spectrum peculiar to itself, it is obvious that, in order to detect the presence of any particular element, we must obtain it, or its compound, in the state of a luminous vapour. It is rarely that we meet with uncombined elements in nature, and even when we do, they are usually of such a kind as require extremely high temperatures before they can be converted into vapour; therefore it is generally a compound of the metal sufficiently volatile at a moderate degree of heat that is used. In the mineral kingdom, however, metals usually occur in combination with more or less fixed acids, forming salts, which are generally non-volatile, and not easily decomposable. As instances of these we may take sulphate of barium in heavy spar, and the silicates, such as orthoclase, which are unacted on by acids. It is an easy matter enough to recognise the presence of any particular body by the appearance of its spectrum; but the difficulty which I have always found is to easily obtain a spectrum under all conditions of metallic combination. Bunsen and Kirchoff recommend the treatment of silicates first with hydrofluoric acid, or fluoride of ammonium, in a platinum dish, then treating with sulphuric acid, evaporating to dryness, and dissolving out the salts, again evaporating, and then examining the residue in the spectrum apparatus. This decom-

position of the minerals under examination is comparatively tedious and troublesome, and is worth trying to avoid.

"After many trials of different methods which suggested themselves, I think I have found one by means of which the decomposition of most minerals may be effected at high temperatures, and the spectra of the constituent metals observed with some degree of certainty.

"It is a well-known fact that the spectrum observed during the decrepitation of *any* salt is much more brilliant and intense than that produced during the simple volatilisation of the particular compound. We may assume without much hesitation that the water is the prime agent in producing this result. The decrepitation spectrum, if I may so call it, of any chloride, and that afforded by the *chlorate* of the same metal, bear many points of resemblance. It would seem, therefore, that the presence of free oxygen materially affects the brilliancy of the spectrum. With a chlorate of a metal oxygen is given off on heating; but with a decrepitating salt the case is different—the water, suddenly set free in the flame, almost instantly attains a very high temperature; its constituents then exist in the condition termed by Hoffman and by Deville 'disassociation,' in which state the oxygen of the water is to all intents and purposes free. I have based the mode which I now adopt in treating minerals on these observations, and likewise on the well-known fact that the presence of water at high temperatures effects the decomposition of a large number of saline combinations, otherwise perfectly unalterable by heat alone.

"The apparatus which I use is very simple, consisting of an ordinary Herepath blow-pipe jet, through the air tube of which a fine current of steam is sent into the interior of the flame. The steam jet must not be sufficiently powerful to blow the test specimen off the platinum wire when the latter is held in the flame. When the jet has been properly adjusted, the flame should be moderately long, and of a pale greenish-blue colour. These conditions are easily realised by the arrangement of the inner tube delivering the steam. Most of the minerals which I have examined are decomposed with facility when subjected to the action of the blast flame.

"When it is only necessary to ascertain the presence or absence of a member of the alkali group in a silicate, I have occasionally taken advantage of the plan proposed by Cartmell for another purpose. It consists simply in heating a mixture of the powdered mineral and pure gypsum on a platinum wire in the flame of a Bunsen burner. The silicate is decomposed, silicate of calcium and sulphate of the alkali or alkalies being formed, which latter volatilise at the temperature of the gas flame."

SOUTH WALES INSTITUTE OF ENGINEERS.

A general meeting of the members of this Institute was held at Cardiff, on 13th July, Mr. A. Bassett, President, in the chair. Mr. W. Menelaus was elected President for the ensuing year. Mr. Thomas Evans, Government Inspector of Mines, said that at the last meeting a paper was discussed on coal and ironstone mining in Scotland, written by Mr. Ralph Moore. The statements made in that paper as to the cost of raising coal in Scotland rather startled them, and were rather questioned at the time. Mr. Moore felt that his reputation was at stake, and he had forwarded him (Mr. Evans) statistics giving the exact cost of raising coal in several Scottish collieries. In the No. 1 example referred to in Mr. Moore's paper, the cost of the coal at the pit's mouth was only 3*s.* 3*d.* per ton; No. 2, 1*s.* 5⅝*d.* per ton; and No. 3, 2*s.* 9*d.* per ton. These figures, which were duly authenticated by several colliery proprietors, conclusively proved that Mr. Moore's statements were based on facts.

The President said that he was glad that Mr. Evans had received this paper, as he really felt some doubt as to the figures given himself, or at

least he thought that the coal was only raised at the price mentioned when the circumstances were unusually favourable. The statistics in the paper, however, completely set all doubt at rest.

Among the papers read were—"On Coal Mining in Lancashire," by Mr. R. H. Wynne; "The Copper Sands of Alderley, Cheshire," by Mr. G. C. Greenwell; and "On the Machinery used in Boring Artesian Wells, and its application to Mining Purposes," by Mr. Mather. With reference to the last-named paper, Mr. J. Murphy said he should like to know the cost of boring by this machine.

Mr. Mather explained that the machines were let out on hire, and statistics of the cost had been furnished by several parties. In one instance, the average cost of boring two feet diameter through the red sandstone was 10*s.* per foot. A machine was now being made suitable for three feet diameter.

Mr. Maynard inquired whether there would be any difficulty in making it five feet, so as to be applicable to coal mining purposes.

Mr. Mather replied that he saw no difficulty in increasing it to five feet, as the principle of the machine was capable of extension.

Mr. Thomas (Coleford) said if the machine could be brought into practical use in connection with collieries, it would be a valuable invention.

PETROLEUM AND OILS AS A FUEL.

A recent number of the *Mining Journal* has an important article on the inapplicability of petroleum, or any other mineral oil as a substitute for coal as a fuel, from which we abstract the following remarks:—

"The fallacy of the proposition to employ petroleum as a substitute for coal in the generating of steam daily becomes more evident, notwithstanding the continued efforts which are made to propagate erroneous assertions as to its economy; neither petroleum nor mineral oil of any kind can successfully compete with coal as a steam fuel until coal is twelve times more costly than at present, or until petroleum can be sold retail at less than 3*d.* per gallon. The objection applies equally to natural and artificial oils, although, in the latter case, the cost which would necessarily be incurred in its manufacture would render its employment so much the more disadvantageous. From time to time attempts have been made to utilise the produce of the Pitch Lake of Trinidad, by employing the products that are obtainable from it by distillation, but hitherto the results have been anything but satisfactory; yet, amongst the more recent opinions published is that of Dr. Konrad Stolmeyer, of Port of Spain, in which he advocates the use of crude oil from Trinidad pitch, but he has evidently been guided only by the interest of Trinidad in making his assertions, and is altogether unsupported by either practical results or experiments. He maintains that liquid fuel, such as oil, wherever obtainable at a price not exceeding *twice* the cost of coal—for a quantity equal in power for evaporating water to a given quantity of oil—is preferable to coals for oceanic steam navigation for various reasons. He considers that there would be a saving of space and weight, because 40 gallons of crude oil from asphalte are considered equal to 1 ton of coals. As the oil varies in density and power, it would be quite safe, he thinks, to take, for practical application on a large scale, 50 gallons of crude oil, average specific gravity 0·900, as an equivalent to 1 ton of such coals as are usually supplied to steam-vessels, though experiments in the laboratory point to a lesser quantity. This would reduce the weight of the necessary fuel for a sea voyage to one-sixth. By constructing tanks with reference to the shape of the vessel, the necessary space required would be reduced to one-fourth. Now, even assuming Dr. Stolmeyer to be correct in his proportions, it must be remembered that

he makes no mention of the first cost of the tanks, which would be larger nor of the expense of keeping them in repair.

"He next states that the time in taking in fuel at ports of departure and intermediate stations would be reduced to about one-tenth—oiling instead of coaling. One hour would be sufficient to deliver, through suitable pipes, a quantity of oil equal to coals which would require ten hours to take on board; he considers, moreover, that the number of men necessary to attend to the fires could be reduced to one-fifth, and that their labour would be comparatively easy. This may be true, but the labour saved at the fires would have to be expended in keeping the feeding apparatus in repair. Mr. Stolmeyer states that perfect combustion being possible with liquid fuel, no smoke would issue through the chimneys. This is a theoretical assumption only, and perfect combustion is also possible with all the ingredients of coal capable of producing smoke. He considers there would be less liability to accidents from fire, because spontaneous combustion in the tanks is impossible, but surely he cannot forget that a very slight leakage would soon render the whole ship highly inflammable. He asserts, that the time required to get up steam would be reduced to one-half, and that from one to two minutes would be sufficient to extinguish the fires. He anticipates that there would be a reduction of space in the fire-room, and probable reduction in the size of boilers. He says a larger quantity of fuel could be kept on hand at foreign stations, or in anticipation of hostilities, when coals and fuel generally for steamers of war might be declared contraband of war, without fear of deterioration in quality. Close tanks and reservoirs would supersede coal-sheds, with their attending inconveniences and liabilities to being fired. Now, it can scarcely be supposed that Dr. Stomeyer knows so little about mineral oils as to make these statements in ignorance. The deterioration of mineral oils is three times that of coal, and as to the tanks being more exempt from damage from fire than the coal-sheds, the accuracy or inaccuracy of the assertion would depend entirely upon the material of which they are made—made of the same material, the advantage would be altogether on the side of coal.

"So many objections to the use of petroleum as a substitute for coal existing, it is scarcely necessary to consider Dr. Stolmeyer's remarks upon its application and supply, except, perhaps, to show that his opinions upon this portion of the subject are equally vague and unsatisfactory. He states that there are various modes by which the liquid fuel could be applied. In the beginning, before the present construction of boilers, fire-rooms, &c., can be modified and properly adapted to a new material, which is like all new contrivances, a matter of gradual development, it might be used as an auxiliary to coals. Jets of liquid fuel, finely divided by a rose, similar to the ends of watering pots, could be thrown at intervals of a few seconds, by means of a force-pump, over the burning mass. The coals would absorb the oil and would transform it into flame without falling into ashes. Later, upright tubular boilers would replace the present horizontal boilers. Each tube would have its separate fire (lamp), the tube acting as the chimney, similar to the chimneys of the kerosine and other mineral oil lamps. He considers that the ingenuity of mechanical engineers would soon establish a simple, effective, and almost self-acting mode to supply the liquid fuel as fast, and no faster, than it could be converted into flame; and he continues, that the next question would be the supply, since it is of little use to invent applications for a material, if that material is not almost inexhaustible for practical purposes. Without taking into consideration the fact that oil can be extracted from coals if all other resources were exhausted, the discovery of the oil springs in North America, which have already furnished millions of gallons of crude oil, are likely to keep the supply at a sufficient low rate as to price to make liquid fuel an economical substitute for coals where weight and space are of importance. But even

if these oil wells should become dry, and no new ones be discovered—though called oil springs they cannot last like springs of water, but must have a definite quantity, and become dry in time—we have another source of supply in the Island of Trinidad.

"To turn from an opinion based merely upon theory of a most unacceptable kind, by a gentleman whose especial interest it is to secure a sale for an article produced in his own neighbourhood, to that of another who asserts merely that which he has actually proved, we find that no hope whatever can be reasonably entertained of burning petroleum as a steam fuel at least for many centuries. Dr. R. A. Fisher, of New Haven, Connecticut, has undertaken a series of careful experiments to ascertain the value of petroleum burned by Mr. Hill's method, as compared with anthracite coal for generating steam. By Mr. Hill's process the petroleum is evaporated in a close box, steam is mixed with the vapour, and the vapour is burned as it issues from batswing burners. Dr. Fisher burned petroleum by this plan several hours under a small boiler, and measured the water evaporated. He then burned anthracite coal under the same boiler for four hours and thirty-five minutes, and measured in this case also the water evaporated. The steam was generated under a pressure of 40 lbs. to the square inch, and hence from a temperature of 268°. After making proper allowances for the heating of the water, the results were 7·81 lbs. of water, at 268°, converted into steam by 1 lb. of petroleum; 4·89 lbs. of water at 268°, converted into steam by 1 lb. of coal—or, 2,000 lbs. of coal gave the same heating power as 1,252·2 lbs. of petroleum.

"A result more conclusive than this against the use of petroleum as a steam fuel will, probably, not be required; but it may be well to state that Dr. Fisher calculates that with coal at $10 per 2,000 lbs. (2*l.* 5*s.* per ton), petroleum of the quality used in the experiments just described, in order to compete with coal, must be furnished at $10 for 1252·2 lbs. (198·69 gallons), or at 5·02 cents (2½*d.*) per gallon. But if burned in the apparatus of Mr. G. Hill, it must be furnished at a still lower figure; for while with coal the whole amount of steam generated can be used to drive machinery, in Mr. Hill's apparatus a large proportion of the steam produced is required to assist the combustion of the petroleum. No experiments were made to determine exactly the quantity of steam thus employed, but from the fact that the coal evaporated but about 4 gallons of water per hour while the petroleum evaporated about 6 gallons, without causing more steam to pass through the safety-valve, we must infer that the steam produced from 2 gallons of the water per hour (or about one-third of the whole amount generated) passed through the steam feeding-pipe into the retort, and thence to the burners. In view of all the facts elicited by these experiments, the conclusion is, that at the present New York prices of petroleum and coal (coal 2*l.* 2*s.* per ton, petroleum 2*s.* per gallon), the cost of fuel in Mr. G. Hill's process, of burning the vapour of petroleum in contact with superheated steam, is about ten times as great as when generating steam with coal.

"Dr. Fisher observes, upon the authority of Tate, that the oils (petroleum), as found in nature, contain, as nearly as possible, an equal number of equivalents of carbon and hydrogen. This would make the composition of crude petroleum nearly identical with oil of turpentine. MM. Favre and Silbermann, in their researches found the heat evolved by the perfect combustion of 1 lb. of turpentine to be sufficient to raise only 108·52 lbs. of water from 31°—212°. This, then, is about the maximum calorific power of crude petroleum—11·64 per cent. greater than that of anthracite coal. Therefore, whether the perfect combustion of crude petroleum be effected by burning it directly, or after having converted it into gas; whether it be burned in the state of vapour alone, or mixed with air or "superheated steam" (as in Mr. Hill's apparatus); or though the mechanical arrange-

ment consists of "a series of corrugated recesses upon a vertical cone of cast-iron placed in the furnace" (as contrived by Messrs. Shaw and Linton), it is impossible to develope a greater calorific power than that with which it has been endowed by Nature—that of heating about 108 times its weight of water from 32°—212°, a calorific power not quite 12 per cent. greater than that of anthracite coal; it is, therefore, he concludes, fallacious to suppose that at the present relative prices of coal and petroleum this substance, by any "improved method of burning," can be made to generate steam as cheaply as coal."

COAL MINING IN LANCASHIRE.

By R. H. Wynne, Mining Engineer.*

The coal-field of Lancashire, extending as it does over an area of upwards of 200 square miles, presents many features of interest in the variety of methods adopted for the extraction of the mineral in an economical manner, in consequence of the many peculiarities which prevents any definite rule from being carried out over the whole of the coal-field. The following examples may be quoted to show the necessity of departing from any particular plan:—The inclination and thickness of the seam, the difference in the quality of the veins of coal, and the nature of the strata forming the roof and floor of the mine; in addition to these, the greater depth of the minerals from the surface is causing great alterations to be made in the methods previously in use. This coal-field, in its entirety, may be said to consist of several distinct districts, such as St. Helen's, Wigan, Halton and Bolton, Tyldesley and Manchester, Oldham and Ashton-under-Lyne; a portion of the last-mentioned district is in the county of Chester, but for all practical purposes it may be included in the Lancashire coal-field. In addition to the main coal-field, there are two small and detached districts—one in the neighbourhood of Burnley, of a basin-like form, the town standing in the centre of the basin, bounded by the Millstone Grit formation on the north side, and connected with the main coal-field by a belt of the lower coal measures, which are comparatively unproductive; and the other on the north-north-west side of Manchester, wholly enclosed by Permian and new red sandstone strata.

The modes of working usually adopted in Lancashire are various modifications of the pillar and stall method, but the system of long-work has been introduced in several instances, especially in the newest cannel works in the Wigan district, where it is found to answer admirably. Long-work would be much more extensively adopted but for the difficulty in inducing the Lancashire colliers to accustom themselves to the practice of holing a sufficient length of face some time previously to the coal being required to be loaded, as in that case the weight of the face is of great assistance to the collier in getting the coal, and a more saleable article is produced, which is the great secret of the success of long-wall working in Staffordshire, Derbyshire, and Shropshire.

The Wigan portion of the coal-field may be said to be the most important district in the county; it is divided into belts, bounded by several large parallel faults, which range north-west and south-east, having throws varying from 150 to 600 yards, thus showing a section of upwards of 900 yards of the middle series of coal measures, containing some of the most valuable seams of coal in the county; of these may be mentioned the following:—Ince 4′; Ince 7′; Pemberton 5′; Pemberton 4′; cannel, king coal, yard coal, Orrel, 5′, or Smith coal, and the Arley mine coal, all of

* Abstract of paper read at last meeting of South Wales Institute of Engineers.

which are found in one or other of the belts within a comparatively short distance of the surface. The cannel coal of this district is of world-wide celebrity for gas-making purposes, and has been worked on the east side of the Haigh fault, where it is found near the surface; for a great number of years it has also been worked extensively in most of the other belts, and shafts have been sunk within the last few years to depths varying from 500 to 700 yards, the cannel being found to be of excellent quality. In some of the newer and deeper collieries the long-wall system of working has been adopted, the wagon-ways being carried through the goaf, rails being laid along the face of work, and moved occasionally as the excavation advances. In other collieries, especially those where the depth is not so great, the pillar and stall method is generally employed, parallel levels are are driven to the extremity, leaving pillars or ranks of cannel about one hundred yards in width between each pair of parallel levels; wide drifts are afterwards made from one level to the one above, leaving ribs about ten yards in thickness between the drifts; on the completion of a sufficient number of drifts the pillars are got out.

In the neighbourhood of Wigan a modified form of long work has been used in getting the yard coal. Main levels having been driven to the extremity, pairs of up brows are commenced about 100 yards apart. From these brows a long-wall face of work is started, the drawing roads being through the gob, and parallel to the main level. On this plan the rank or pillar of coal is got out without any inconvenience being felt from the subsidence of the strata above, causing the drawing-rods to become too low for the passage of the wagons.

Cannel is also extensively worked in the Hulton and Bolton district, but it is not so good in quality or thickness as that found in the vicinity of Wigan. In getting the cannel, pairs of levels are driven in opposite directions from the shaft, and from them main up-brows are driven. Out of the up-brows, and at right angles thereto, levels are commenced at intervals of 50 yards, thus leaving pillars of cannel 50 yards broad, separated by pairs of levels. These pillars are again cut across by narrow lays or drifts eighteen yards asunder, and the cannel thus cut into parallelograms 50 yards long by 18 yards wide, is ultimately brought back, 9 yards being taken from both sides of each narrow bay.

A short account of the mode of working the half-yard coal in this district may be found to be interesting as a description of the plan pursued in a thin seam. This coal, as its name implies, is about 18″ in thickness. A series of levels are driven about 20 yards apart, and connected together by up-brows or slants, as may be found to be most convenient. The levels are single, and are generally about 6 yards wide; on the upper side of the level sufficient warrant is taken up to make a drawing-road, the *débris* being built up at the side, leaving a space at the lower side to serve as an air-course. On the completion of these levels, bays or drifts are commenced at the end of each most remote from the pit, and after they are driven through to the level above, the props are taken out, the roof is allowed to fall in, and another drift is commenced close to the excavation made by the first drift. It is not found necessary to remove any portion of the warrant earth in the drifts, as the coal is taken down to the wagon roads in small tubs without wheels, and is there re-loaded into the large tubs in which the coal is brought to the surface.

In the neighbourhood of Dukinfield, in the county of Chester, the plan of working is somewhat different to any previously described. The steepness of the beds of coal in this locality offer greater difficulties than are usually met with in other parts of the coal field. The levels are driven to the extremity, about 20 yards apart, connected by brows at intervals of 50 yards, the ranks are afterwards split into blocks of 10 yards in width, as it is found that in attempting to bring back 20 yards at a time much

loss is sustained by the coal being crushed, in consequence of the whole of the face not being worked over in one day; it is also found advisable to keep the faces of work as near as possible at right angles to the levels or wagon ways, for by extending the face so as to form an obtuse angle with the levels it throws the work too much on the face of the coal, which is found to be objectionable and dangerous from falls of roof.

The means of ventilation used in the collieries of Lancashire are various, comprising furnaces in the pit, and on the surface chimneys connected with the engine, boiler fires in the pit, discharged steam from surface and underground engines, and in a great number of instances, especially in cold weather, the ventilation is carried on without artificial power. Some of the seams evolve large quantities of fire-damp, especially when the working is first commenced, thus showing the necessity of completing the straight work before commencing the pillar work. Much improvement has been made in the ventilation of the Lancashire collieries during the last few years, and the number of explosions have, in consequence, been much reduced, the district not having been visited for upwards of six years with any of those dreadful calamities which were, unfortunately, much too frequent several years ago.

Extracts, Notes, and Memoranda.

Geological Society of London.—Among the papers read at the Meeting of this Society, on June 22nd, were: "On the Carboniferous Rocks of the Donetz and the Granite-gravel of St. Petersburg." By Prof. J. Helmersen. (In a letter to Sir R. I. Murchison). This letter relates (1) to the discovery in the Donetz Mountains of additional beds of coal and of iron-ore; (2) to the proposed use of this coal for steam-purposes on the Volga; (3) to two geological expeditions to be sent out in 1864 for the purpose of surveying the Permian basin of Russia; and lastly, to the successful completion of an Artesian boring at St. Petersburg. In this well the following beds were passed through:—Alluvium, 88 ft.; Silurian clay, 300 ft.; sandstone, 137 ft.; bed of gravel, the result of the degradation of granite. "On the Formation and Preservation of Lakes by Ice-action." By Mr. Thomas Belt. Communicated by Prof. Ramsay. During a residence of two years in the province of Nova Scotia, the author observed the remarkable number of lakes, great and small, occurring there, sometimes in connected chains and sometimes on the sides and tops of hills. The lake-basins are stated to be, chiefly, in extremely hard quartzites and metamorphosed schists, irregularly studded with masses of boulder-clay, beneath which are seen scratches, grooves, &c., that have been produced by ice-action. The author then de cribed all the phenomena in detail, and gave a *résumé* of the theory of their glacial origin, as propounded by Professor Ramsay, coming to the conclusion that in this way only can the facts be consistently explained.

Application of Water-Pressure to Coal-cutting Machinery.—This invention consists essentially in the application of a longitudinally reciprocating slotting tool set in motion by the pressure of water, so as to produce a steady to-and-fro motion or powerful cut, without any striking or percussive action, instead of employing steam, air, or gas for such purpose. The mechanism to be employed for giving motion to the slotting tool consists of an arrangement of a double or single acting hydraulic reciprocating motive power engine, provided with proper valves and with a cylinder and piston or ram, or with a moveable diaphram, which directly

or indirectly give motion to the cutting tool or tools. In all cases the cutting stroke of the tool is produced by the pressure of the water. The return or non-cutting stroke may be effected by the same water pressure either directly or indirectly or by springs or weights. Thus the hydraulic reciprocating engine may be either single or double acting to effect the desired object, viz., to make a steady cut at the desired angle without any striking or percussive action. In some cases, it is intended to hold fast the machine, as each cut of the tool or tools is being made, by causing an hydraulic ram or cylinder, piston, plunger, or rod, or a combination of them, to be forced against the roof of the working place, and thereby hold the machine firmly down upon its guiding rails whilst the cut is being made, but to release it again at the return or back stroke of the cutter in order to allow the machine to be moved forward for the succeeding cut. This alternate "fixing" and releasing of the machine is produced by allowing the water to operate on the hydraulic ram, and at the time it enters the motive cylinder, and thus a pressure is obtained against the roof to hold the machine firm upon its rail or guide during the cutting operation of the tool or tools. This condition is further secured by the application of a keep valve or other equivalent contrivance. The release of the machine from the hold against the roof is effected by allowing the water to escape during the time the back stroke of the cutting tool or tools is being made.

A Californian Marvel.—Mr. T. Hansbrow, of Sacramento, whose improved amalgamator was noticed in Vol. V., p. 158 of this Magazine, has invented a hydrostatic engine which is thus described by a Californian paper:—"This engine runs entirely by the pressure (not volume) of water, works cold water as an expansive agent, and does it most admirably. A tin model is now being exhibited, which, though rudely constructed, shows the power of the engine, it being a man's work to stop the motion. It will supersede steam wherever a pressure of water can be obtained. In this respect it will be especially serviceable and invaluable throughout the mining regions of California and the Pacific coast, as well as in our cities where there is a supply of water from public works. Intelligent mechanics who have examined the rough model unite in pronouncing it the greatest invention of the age; and, like all great inventions, it is simplicity itself."

Treating Poor Lead Ores by Hydrochloric Acid.—M. H. C. Lampadius (a name classical in the annals of metallurgy), engineer of the mines at Vüseck, states that the ores of those mines, according to their richness and the specific gravity of the acid, are treated with the proper quantity of hydrochloric acid to form chloride of lead. The transformation into chloride of lead operates completely when the ores have been well prepared. This chloride is introduced into double-bottomed vats, and sprinkled with a sufficient quantity of boiling water. The solution of chloride of lead thus obtained is drawn off into reservoirs, and left to settle. The mother-waters, which contain only a very minute quantity of chloride, are reserved for a new solution. The chloride is then treated with a minute quantity of pure water by metallic zinc. There is thus formed chloride of zinc, and metallic lead is separated in a dense and spongy mass, which after being washed may be melted in an ordinary furnace. The solution of the chloride of zinc is first freed from any iron that it may contain by a little chloride of lime, and the zinc is then precipitated in the form of oxide of zinc by means of calcined chalk. It may thus be utilised for zinc white, or it may be reduced and used again. As hydrochloric acid is of a moderate price, and as the expense of the zinc is covered by the sale of zinc white, this process ought to be advantageous in the treatment of ores too poor to be treated by fusion.

A NEW PATTERN WHIM.—Mr. J. W. Wedlock, of Virginia City, Nevada Territory, has invented a whim supposed to be superior in some respects to those in common use. The drum revolves horizontally, and, by means of small wheels on the shaft passing through its centre, is driven by a larger cog-wheel, on an upright iron shaft, to which the horse is attached by a lever. The horse travels one way round all the time, the change in the motion being effected by throwing the small wheels in or out of gear, they being on a sleeve, sliding on the shaft of the drum. There is also a brake attached to the drum, which is worked by a lever. The cost of the apparatus is about $1,400.

MR. BESSEMER'S LATEST IMPROVEMENTS IN THE MANUFACTURE OF IRON AND STEEL.—In the manufacture of malleable iron and steel from pig or other carburet of iron by forcing atmospheric air into the molten metal, now generally known as the Bessemer process, a reverberatory furnace has generally been employed to melt the crude metal, and it has been found that a loss in the original weight takes place, and also that some of the carbon present in the iron is lost, while the proportion of sulphur it contains is augmented. The first part, therefore, of these improvements has for its object the lessening of the quantity of iron and carbon lost in the melting process, and also the lessening of the quantity of sulphur absorbed, while at the same time the quantity of fuel consumed in the melting furnace is diminished. For this purpose a reverberatory furnace is employed constructed in the usual manner when for melting pig-iron, excepting at that end of it which is nearest the chimney, where it is provided with a second hearth or chamber having a flat bottom, through which the flames and heated products of combustion pass on their way to the chimney. This chamber may be a simple elongation of the bank on which a portion of the metal is to be melted; but it is preferred to separate the melting chamber from the second chamber by a dip in the roof so as to contract the aperture leading from the first to the second hearth. The bed of the second hearth may be made moveable on wheels so as to facilitate the removal of the pig metal to the converting vessel. When the metal occupying the first chamber is melted the metal occupying the second one will have become highly heated and may then be put into the converting vessel while still in a solid state and the molten part of the charge be immediately run into the vessel with it; the converting vessel may then be turned up and the forcing in of atmospheric air be proceeded with in the usual manner. When steel is required the process may be arrested at that stage when the desired amount of decarbonization has been arrived at, or the metal may be wholly or nearly decarbonized and then have mixed with it a further portion of carburet of iron in such quantity as will give to the converted metal the degree of hardness or temper required. The white pig-iron known as Franklinite, or that known as Spiegeleisen, mixed with a small quantity of grey iron containing from 4 to 5% of silicon, has been found most suitable for recarbonizing the converted metal and is now generally employed for that purpose. The metal heated on the second hearth may be of some other kind or quality of iron either in its crude or in a refined or a partially refined state. The second part of these improvements relates to economising the fuel, and at the same time lessening the wear and tear of furnaces by employing the converting vessel as a heating or melting vessel, wherein the metal to be converted may be highly heated while in the solid state, and without removal from the vessel, at once converted into malleable iron or steel. When solid fuel is to be employed for this purpose, a fire may be lighted in the converting vessel, and a moderate blast may be employed until it is well ignited. The carburet of iron, whether in the state of pig-iron, or refined in any way, is to be thrown upon the fuel, and the blast then urged until the metal is very highly heated; the vessel is then to be turned into

the position to receive some molten carburet of iron, which may then be run in from any suitable melting furnace or ladle. When this is done, any fuel still remaining unconsumed may be raked out of the mouth of the vessel, which may then be turned up, and the process of the decarbonization at once commenced by forcing upwards through the fluid metal atmospheric air, or other gaseous matters capable of decarbonizing and raising the temperature of the metal.

NEW ALLOYS OF SILVER.—M. Peligot, the chemist to the French Mint, in making experiments to ascertain how the introduction of zinc, or the complete substitution of zinc for the copper, in the new French coinage—which was to consist of 835 parts silver and 165 parts copper—would affect the alloy, has discovered that alloys of the legal standard, in which part or the whole of the copper was replaced by zinc, are remarkably malleable, and when rolled are perfectly homogeneous. They are of a beautiful white colour, but the binary alloy of silver and zinc is somewhat yellowish. The fusibility of the zinc alloys is greater than the copper; they are very sonorous and elastic, and if made brittle by hammering, the malleability is restored by heating. The study of the atomic alloys showed that equal equivalents of silver and zinc, or two equivalents of silver to one of zinc, gave malleable alloys, while the compounds of one equivalent of silver and two equivalents of zinc, and also of two equivalents of silver and three equivalents of zinc, are too brittle to be rolled. Besides the recommendation of being cheaper, the zinc alloy blackens less readily with sulphuretted hydrogen than the copper compound. An alloy of 800 of silver and 200 of zinc will keep its whiteness in a solution of polysulphide which will rapidly blacken the legal alloy of copper and silver.

CAST-STEEL TWYERS.—Mr. T. E. Vickers, of Sheffield, has patented an improvement in the manufacture of cast-steel twyers, communicated to him by J. Mayer, of Bochum, Prussia. These twyers have hitherto been cast singly, each in a mould by itself, thus involving considerable labour in the preparation of the moulds. As an economic substitute for this plan it is now proposed to cast what may be termed a cylinder, presenting the profile of two or more twyers (by preference six and upwards) piled one upon the other. This cylindrical casting is to be divided up into twyers in a turning lathe or by saws as may be found most convenient, and the twyers may then be finished in the usual way.

A NEW AMALGAMATOR.—Mr. O. H. Taylor, of San Francisco, proposes a new form of amalgamator, in which the pulp is forced through pipes into quicksilver with the aid of steam or compressed air, or by a pressure of steam or air on the surface of the pulp confined in tight tanks. The inventor estimates that by these means a ton of gold ore can be amalgamated in less than an hour.

PROPS AND SUPPORTS FOR MINES.—Mr. George Elliot proposes to make the props and cross-pieces used in supporting the roof in working coal and other mines of wrought or malleable iron, instead of timber or cast-iron, as has been hitherto done, by which greater strength is obtained, less expense incurred, and more room is gained for the galleries of the mine. The wrought iron props may be solid or hollow, and of any convenient shape, but it is preferred to form them with a section of three ribs, equidistant, springing from a centre, or four ribs forming a cross. It is also proposed to employ shoes of metal or wood to support the props, and to interpose similar blocks between the top of the props and the horizontal cross-piece.

NEW AMERICAN PROCESS FOR SEPARATING GOLD AND SILVER.—Mr. E. Balback, of Newark, U.S., proposes to melt the lead which contains

the gold and silver in a furnace with an inclined hearth, and then to draw it off into a kettle containing a proper quantity of zinc to take up its silver and gold. After being sufficiently stirred for this to be effected, the mixture of lead, silver, gold, and zinc is cast into pigs and remelted in a furnace, with an inclined hearth, at a low heat, sufficient to cause the lead to melt and run off but not sufficient to melt the zinc, silver, and gold.

Chilled Cast-Iron Pit Tubbing.—Instead of casting the iron in sand, Mr. John Gibson proposes to cast it in iron moulds, the effect of which is to cool the surface of the casting rapidly, and thus cause the outer portion of the casting to become closer in grain to the depth required, so as to render the metal more capable of resisting corrosion. It is said that cast-iron tubbing thus manufactured, when used in the shafts of collieries and mines, is protected from the usual tendency to rapid corrosion arising from the combined action of smoke and moisture.

Tempering Castings of Steel and Homogeneous Metal without Mechanical Compression. — Mr. Joseph Whitworth, of Manchester, proposes to dispense with the ordinary mechanical compression of steel and homogeneous metal by the action of steam hammers, or apparatus of that class, and to give the metal the requisite closeness and strength by casting it in a form approximating to that in which it is intended to be used, and by immersing it without any previous forging in a bath of suitable liquid, such as oil or water, and giving it afterwards, where requisite, the temper necessary to enable it to be worked. The metal being made by this process so much harder and stronger, it will be desirable in some cases to rough turn, bore, or shape the casting preparatory to the hardening and tempering of the metal.

Separating Ores from their Gangues.—Mr. W. Clarke has patented an apparatus for separating auriferous, argentiferous, and other ores from their gangues, which is distinguished from those ordinarily used by the separating process commencing at the lower part, the gangues passing in an upward direction. It consists of a cylindrical receiver of metal mounted on a frame, with a hollow axis passing down its centre, and to the lower end are applied the wings or blades receiving rotary motion from bevil wheels mounted at the upper part of the apparatus. The ore to be separated is received in a hopper at the top of the apparatus, which may have an oscillating motion imparted to it; a jet of water is also introduced for the purpose of carrying the ore down into the cylinder. The ore is conveyed through the hollow axis to the lower part of the apparatus, where it is acted on by the blades, which in rotating produce the separation of the gangues, and cause them to enter two compartments forming a double casing round the inner chamber. The cylindrical chamber, as also the outer casing, should be completely filled with water; suitable cocks and a manhole are applied at the bottom part of the receivers, the gangues passing out of the cocks of the outer casing, while the rich ore is withdrawn by means of the manhole.

Casting Ingots of Steel.—Mr. W. D. Allen, of Sheffield, proposes to prevent the sudden chilling of the steel by coming in contact with the iron mould, and also to protect the mould from injury by direct contact with the molten metal, by lining the inside of the mould with a thin coating of loam, clay, or other suitable material that is a slow conductor of heat. The moulds may be perforated to allow of the escape of the heated air contained in the lining.

Pulverising Ores.—Mr. C. Pengilly, of Bodmin, proposes for this purposes the use of conical or tapering crushing rollers, the largest diameter of which is to be at the bottom end, so that the space may be larger at the top where the stuff to be crushed is introduced. The rollers

are to be corrugated, except at the bottom, the corrugations of one roller crossing those of the roller working against it, by which means greater reducing power is obtained.

The first number of the *Geological Magazine*, a new monthly Journal of Geology, appeared in July under the Editorship of Mr. T. Rupert Jones and Mr. Henry Woodward. This Magazine starts under the fairest auspices, and we have no doubt it will worthily maintain the position it takes as the acknowledged representative of English Geological Science.

The Glasgow School of Mines is to be abandoned, the anticipated subscriptions from the coal and ironmasters not having been forthcoming. This result has been long foreseen, and a similar fate may soon be expected to overtake the two or three institutions of a similar character which are now dragging on a precarious existence in some of our mining districts. The subject of the practical education of our mining population is one of great importance; but it must be dealt with by different, and stronger, hands than those who have recently so unsuccessfully meddled with it.

We have to announce the death of Mr. James Wolferstan, of Plymouth, which took place on June 28th. Mr. Wolferstan was for many years the manager of numerous mines in East Cornwall and Devon, among which may be mentioned, South Tamar, East Tamar, Tamar, Bedford United, and South Herodsfoot Mines.

We also regret to announce the death, at the age of 66, after a protracted illness, of Mr. John Tippet, of Truro, which took place on July 13th. Mr. Tippet was the purser of Wheal Jane, South Seton, and Falmouth and Sperries mines, and was well known as a spirited adventurer in Cornish mining enterprise.

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Patents relating to Mining and Metallurgy.

(Compiled from Commissioners of Patents' Journal.—Subject matter only given.)

UNITED KINGDOM.

Application for Patents from June 25th to July 27th.

1,598 (1864). W. E. Newton (com. from E. Diuoq), Apparatus to facilitate the loading of ships with coals and minerals.

1,656 (1864). S. Fox, Treatment of slags or cinders in order to obtain cast-steel.

1,686 (1864). J. H. Johnson (com. from A. H. Everett), Improvements in smelting lead ores, and in refining and softening lead.

1,701 (1864). A Rogers, Apparatus applicable for ventilating mines.

1,714 (1864). J. W. Horsfall, Manufacture of peat, coal, or fuel.

1,766 (1864). R. A. Brooman (com. from C. T. du Motay and E. Karcher), Manufacture of fluoride of silicium.

1,786 (1864). J. Clayton, Furnaces for heating and melting iron and steel.

1,789 (1864). A. Barclay, Manufacture of pig-iron.

1,795 (1864). F. Seebohm, Manufacture of iron.

1,797 (1864). P. G. B. Westmacott, Machinery for dressing stone, and for driving galleries, tunnels, and other works in stone or mineral.

1,804 (1864). H. E. F. De Brion, Protecting and preserving metals from the action of sea-water.

1,815 (1864). E. Young, Drying and calcining iron and other ores.

1,838 (1864). J. Clark, Apparatus for cutting slate or stone.

1,842 (1864). D. Barker, Manufacture of artificial fuel.

1,875 (1864). J. P. Chambeyron, Preventing the oxidation in iron and steel.

1,876 (1864). J. P. Chambeyron, Manufacture of steel.

Patents Sealed from June 28th to July 29th.

31 (1864). J. Williams and G. Bedson, Improvements in puddling furnaces.

390 (1864). H. W. Wood, Improvements in cylinders exposed to the direct action of fire and employed in the manufacture of artificial fuel.

109 (1864). J. E. Baker, Retorts and furnaces for distilling coal, peat, and other solid hydro-carbons.

90 (1864). C. Bartholomew, Improvements in working coal, and in apparatus employed therein.

100 (1864). W. Denton and J. Whitaker, Apparatus for preventing accidents in mines and collieries by the breaking of ropes or over-winding.

158 (1864). G. E. Donisthorpe, Machinery used in getting coal, stone, and other minerals.

1,050 (1864). J. Russell, Machinery for hewing coal and other minerals.

163 (1864). E. T. Jarrold, Improvements in deodorising petroleum and other hydro-carbon oils.

234 (1864). W. T. Bury, A new material for forming moulds for casting steel and other metals.

988 (1864). J. H. Johnson (com. from J. Williams), Improvements in puddling furnaces.

1,258 (1864). J. Webster, Manufacture of zinc.

315 (1864). W. Taylor, W. Molyneux, and H. Harrison, Improvements in puddling furnaces for the manufacture of iron.

341 (1864). B. Todd, Compositions for preventing the oxidation of iron.

PATENTS ON WHICH £50 DUTY HAS BEEN PAID FROM JUNE 23RD TO JULY 22ND.

1,829 (1857). A. SPOTTISWOODE, Machinery for compressing artificial fuel.
1,695 (1861). P. SPENCE, Improvements in economizing the manufacture of sulphuric acid, and in obtaining copper from ores used in such manufacture.
1,884 (1861). C. E. AMOS and J. FRANCIS, Improved machinery for dressing slates.
1,869 (1861). E. HAEFFELY, Improvements in extracting copper from its ores.

PATENTS ON WHICH £100 DUTY HAS BEEN PAID, FROM JULY 4TH TO JULY 6TH.

1,829 (1857). A SPOTTISWOODE, Machinery for compressing artificial fuel.
1,873 (1857). F. C. HILLS, Manufacture of sulphuric acid.
1,947 (1857). W. E. NEWTON (com. from J. H. DEBRAY), Manufacture of platinum.

PATENTS VOID BY NON-PAYMENT OF DUTY FROM JUNE 18TH TO JULY 23RD.

1,742 (1857). SIR F. C. KNOWLES, Manufacture of aluminium, and of certain reagents to be used therein.
1,650 (1861). T. SWINNERTON, Manufacture of coal gas, by the waste heat of blast-ovens and puddling furnaces.
1,839 (1857). E. B. OLOFSON, Manufacture of pigments or colors for preserving iron.
1,726 (1861). A. NOBLE, Obtaining products from alkali waste and gas lime refuse.
1,732 (1861). T. COBLEY, Manufacture of fluo-silicates, and silicates of lead and baryta.
1,734 (1861). T. COBLEY, Treatment of silicates of metallic and non-metallic bases, and other siliceous compounds, in order to recover the said bases, and also the production of fluo-silicic and silicic acids.
1,738 (1861). F. S. BABFF, Induration and preservation of stone.
1,741 (1861). C. COCHRANE, Treatment of gas in its passage from blast-furnaces to the heating apparatus where it is employed.
1,772 (1861). T. COBLEY, Manufacture of metallic and earthy silicates, or siliceous compounds from the metallic and earthy bases.
1,774 (1861). R. TAYLOR and T. PRICE, Manufacture of tin and terne plates.
1,776 (1861). T. COBLEY, An improved process for the manufacture of fluo-silicates of tin, zinc, and baryta.
1,792 (1861). C. D. ABEL (com. from H. C. DE RUHOLZ), Alloys of silver with other metals.
1,921 (1857). SIR F. C. KNOWLES, Manufacture of iron.
1,817 (1861). R. MUSHET, Manufacture of cast-steel.
1,819 (1861). R. LAING and G. H. COSSINS, Improved mode of obtaining nitrous acid gas for making sulphuric acid.
1,986 (1857). A. UPWARD, Manufacture of coke.
2,027 (1857). C. NORRIS, Manufacture of sulphate of alumina.

AUSTRIA.

PATENTS DELIVERED, PROLONGED, AND BECOME VOID DURING APRIL.

159. E. A. PAGET, Improvements in means of blasting rocks. [Delivered.]
172. J. DUM, Improvements in the so-called "Zwettel quartz millstones." [Delivered.]
197. J. A. D. HEIDTMANN, A cutting machine for coal and other mines. [Delivered.]
199. A. NOBEL, Manufacture and application of blasting-powder. [Delivered.]
208. J. RÖSNER, Extracting copper, silver, and gold, from copper ores. [Delivered.]
161. M. Nowak, A waterproof paste for blasting. [Prolonged.]

140. A. Mueller and A. Sencauchez. A peculiar blast-furnace for smelting ores, and especially zinc ores. [Become void.]
163. F. Ehleitner, A peculiar mode of extinguishing fires in coal pits. [Become void.]

BELGIUM.

Patents Delivered from July 1st to July 15th.

16,337. H. Kind, Improvements in sinking shafts of mines.
16,376. L. Henoch, A substance for conglomerating coal cakes.
16,391. Mazeline and Co., Machines for the manufacture of coal cake.
16,394. A. Nobel, Manufacturing mining powder.
16,406. J. B. Bouriez, Machine for compressing small coal, and coke-dust.
16,429. L. Jaminn, Fuel composed of lime and coal.
16,434. R. Weinmann, Apparatus for sifting minerals and metallic sulphurets.
16,444. J. G. Jones, Machine for extracting coal and other minerals.

FRANCE.

Current List of Patents.

61,115. Dawes, Manufacture of iron.
61,136. Weill, Processes for coating metals with other metals.
61,164. Renouard and Co., Manufacture of magnesia.
61,179. Delaporte, A mode of manufacturing Parisian coals by means of colophony.
61,223. Mushet, Manufacture of iron and steel.
61,224. Mushet, Manufacture of iron and steel.
61,238. Davison, Improvements in furnaces for smelting-houses.
61,296. De Tregomain, Conglomerating coal, coke, charcoal, and other fuel.
61,341. Griffiths, Machines for puddling iron and steel.
61,381. Saminn, Economical coal fuel.
61,417. Austruy, Washing machine for washing iron ore.

HANOVER.

Patent cancelled on Feb. 24th.

4. O. Kuehnemann, Manufacturing gunpowder for blasting mines.

UNITED STATES.

Patents Issued from May 31st to July 5th.

43,003. J. B. Britton, Improved furnace for calcining ores.
43,022. H. Halverson, Improved compound of cyanogen and iron.
43,046. S. Stevens, Improvement in roasting and desulphurising ores and minerals.
43,048. J. Thomson and T. Widdowfield, Furnaces for melting metals.
43,061. J. Winchester, Furnaces for smelting ores.
43,067. T. Harrison, Machinery for puddling iron and steel.
43,096. M. H. Collins, Improvement in quartz crushers.
43,112. W. and O. S. Halstead, Improvements in artificial fuel.
43,129. A. F. W. Partz, Improvement in roasting sulphurets and other ores.
43,133. H. C. Rogers, Improvement in coal breakers.
43,140. C. A. Stetefeldt, Improved furnace for desulphurising ores.
43,168. J. Williams, Improved composition for lining puddling furnaces.
43,185. J. R. Deihm and J. Snell, Improvement in coal screens.
43,248. Z. Wheeler and C. K. Hotaling, Stamping mill for quartz.
43,274. W. Raschette, Improved blast-furnace.
43,304. D. Gay and J. H. Purkiss, Improved quartz crusher.

43,363. H. BRADFORD, Improvement in desulphurising ores.
43,385. E. BALBACK, Process of separating silver and gold from lead.
43,429. C. S. POTTER, Treatment of petroleum.
43,443. J. WEISMAN, Manufacture of steel.
43,444. J. WEISMAN, Improved composition for coating metal.

SAXONY.

PATENT GRANTED IN MAY.

15. R. DE MASSY, sen. and jun., Manufacture of salts of baryta and strontian.

SPECIFICATIONS PUBLISHED, AND PRICES.

FROM JUNE 18TH TO JULY 23RD.

*** Specifications will be forwarded by post on receipt of price and postage at Her Majesty's Patent Office, 25, Southampton Buildings, London, W.C.—The amount of postage may be estimated from the price, as follows.—Where the price does not exceed 1*s.* 6*d.*, postage will be 1*d.*; above 1*s.* 6*d.*, and not exceeding 3*s.* 4*d.*, it will be 2*d.*; above 3*s.* 4*d.*, and not exceeding 6*s* 4*d.*, it will be 4*d.*—Sums exceeding 5*s.* must be remitted by P. O. O., on Holborn Office, payable to *Bennet Woodcroft.*

2,642 (1863). J. NICHOLAS, Treating petroleum; 4*d.*
2,659 (1863). W. and S. FIRTH and J. STURGEON, Machinery for cutting and boring coal, stone, &c.; 2*s.*
2,671 (1863). G. E. DONISTHORPE, Apparatus for getting coal; 10*d.*
2,721 (1863). M. HENRY (com. from A. PALLU), Manufacture of zinc white; 4*d.*
2,725 (1863). J. THOMAS, Preparing copper ores for smelting; 4*d.*
2,744 (1863). H. BESSEMER, Manufacture of railway bars; 6*d.*
2,746 (1863). H. BESSEMER, Manufacture of malleable iron and steel; 1*s.* 4*d.*
2,758 (1863). J. TOWNSEND, Manufacture of nitrate of potash; 4*d.*
2,760 (1863). W. D. ALLEN, Casting ingots of steel; 4*d.*
2,786 (1863). R. H. PHILIPSON and J. DEES, Machine for working coal; 4*d.*
2,802 (1863). J. FORTTRELL, Deodorising petroleum; 4*d.*
2,812 (1863). A. CRAIG, Distilling hydro-carbons; 4*d.*
2,819 (1863). W. E. GEDGE (com. from J. B. BAUX and A. GUIOD), Amalgamating precious metals; 1*s.* 8*d.*
2,837 (1863). T. HARRISON, Cutting and excavating coal; 8*d.*
2,852 (1863). W. E. NEWTON (com. from M. A. A. GAUDIN), Manufacture of iron and steel; 4*d.*
2,864 (1863). C. PENGILLY, Pulverising ores; 4*d.*
2,886 (1863). W. M. WILLIAMS, Distilling coal; 10*d.*
2,901 (1863). J. FRANCIS, Separating impurities from small coal; 8*d.*
2,902 (1863). W. H. GRAY, Blast cylinders; 4*d.*
2,903 (1863). J. KIRKHAM, Treating ores of iron; 8*d.*
2,981 (1863). F. PAGE, Furnaces for the manufacture of volatile hydro-carbons; 10*d.*
3,009 (1863). B. JONES, Separating sulphur from alkali waste; 4*d.*
3,034 (1863). T. HARRISON, Cutting coal; 1*s.* 4*d.*
3,037 (1863). R. A. BROOMAN (com. from J. SAUNDERS), Distilling bituminous substances; 4*d.*
3,044 (1863). J. BOWRON and G. ROBINSON, Manufacture of soda and sulphuric acid; 4*d*

Current Review of Mining, Quarrying, and Metallurgy.

CORNWALL, DEVON, AND WEST SOMERSET.

There is nothing new to report in Cornish mining which still continues exceedingly dull. The copper standard has largely advanced, but the paucity of rich copper mines in the county at present prevents this being so generally felt as the continued dullness in tin, the standards for which have again been reduced. This continued decline is exciting great uneasiness among those interested in Cornish tin mining, and several letters have recently appeared on the subject. Capt. William Teague, of Tincroft, writes to the *West Briton* that, in his opinion, the time has arrived when some steps should taken to bring about, if possible, a better system than now exists for the sale of tin ore, and blend the interest of the miner and tin smelter so as to prevent the sudden fluctuations which now take place. A "Tin Miner" writes in the same strain, and all seem to agree as to the propriety of placing the sale of tin ore on a more business-like footing. On the whole the opinions of the large majority of smelters as well as miners seem to be coming round, even more rapidly than we expected, to the views we have long enunciated in this Magazine, of the utter unsatisfactoriness of the present system of disposing of tin ore in Cornwall. It is now clear that the establishment of tin ticketings is only a question of time. All we can say is that, in the interest of all parties—and above all in the interest of the *present* smelters—the sooner it is brought about the better. But although there is no doubt that the adoption of such a system would alleviate this evil, the miners are deceiving themselves if they fancy that it would entirely remedy the depression in the tin trade. The cause of this depression is to be found in a slack demand in the face of increasing supplies. The former is mainly due to the American War, and no doubt will be remedied in time; but supplies seem to be likely to increase rather than diminish. Tin mines are about being worked in France and Germany, and as will be seen in another part of our present number, important discoveries of tin seem to have been recently made in Mexico. The great excess of supply, however, comes from Cornwall, where two-thirds of the tin now returned is raised at a loss; and where one-half the quantity returned would never pay its expenses at even 20*l.* per ton above the present standard. A large number of mines now working never can be fairly remunerative with black tin much under 100*l.* per ton. Why the working of these mines should be persisted in, when they not only entail increasing loss on their unhappy proprietors, but glut the market with their unremunerative produce, cannot, of course, receive any business answer. We know it is treason to say so, but still we do say that the sooner those Cornish tin mines, which, while they make considerable returns still show a regular loss, are brought to a standstill, or their workings greatly curtailed, the better. For our part we see no prospect of this, for hopelessly unprofitable tin mining seems rather to be on the increase than otherwise.

In the case of *West Basset* and *South Frances* notice of appeal to the House of Lords has been given.

Among alterations during the month—*Prosper United* is looking very well in the western portion in Hands' shaft. At *Charlotte United* the engine shaft has improved, and is reported to be worth from 25*l.* to 30*l.* per fm. Mr. John Hosking, of Marazion, late purser, has relinquished his interest in this mine. At *Great Wheal Vor* the prospects at Wheal Metal are very favourable, and the lode in the 184, north of Metal shaft, has considerably improved. At *New Wheal Lovell* a lode is reported to have been cut in the

engine shaft yielding good stones of tin. At *Rosewall Hill* a carbona has been cut in driving the 130 west of the engine shaft, which is reported to be worth from 70*l.* to 80*l.* per fm. *Rosewarne Consols* is said to be looking well.

At *Wheal Seton* Tilly's shaft has fallen off a little; the sump winze is down to the 160 and both ends at this level are to be at once extended on a good course of ore. At *West Seton*, in the shaft sinking under the 90 fm. level, down 5 fm., the lode is worth 12 tons per fm for the length of the shaft; in the 100 west, which is about 7 fm. short of this shaft, the lode will yield 5½ tons of ore per fm., and it is said that in all probability there is another part of this lode still standing in the side. At *Cook's Kitchen* Dunkin's lode has been cut in the cross-cut south, said to be about 4′ wide, and producing good tin stuff. At *Dolcoath* the lode in the 278 east of the engine shaft is not yet cut through, but it is reported to be of the same description as the lode in the levels above - very rich for tin. At *Tresavean* the mine is reported to have improved in the western part. *South Frances* is said to be very poor, but there is some unexplored ground westward in which it is hoped discoveries will be made. *Great South Tolgus* is reported to be looking better. *Grambler and St. Aubyn* is also said to have improved. A good deal of dissatisfaction has been expressed by some of the shareholders at the expensive management of *North Roskear*, where the cost lately has been nearly 2,000*l.* per month. The mine also has not, so far, realised the expectations made as to its value. At *Wheal Crofty* a good discovery is reported in the 70 west of the cross-course. *East Carn Brea* is looking very well. The 60 east on the south lode is worth 3 tons, the west end 6 tons per fm.; the new south lode, cut in the 50, is worth 2 tons and improving; the 30 east and west 2 tons; the 26 east 3 tons and west 2 tons, a winze sinking in the bottom of this level is worth 6 tons for its length—9′. At *East Grenville* the 68 end west is reported to be yielding 8 tons of ore per fm. At *Wheal Buller* the 130 west of Whitford's shaft is said to be worth 12*l.* per fm. for tin and copper. At *Copper Hill* Padden's lode in the 70 west is worth 3 tons of good ore. *Clifford Amalgamated* is reported to be looking better. The reworking of *Ting Tang* under the name of West Clifford has commenced in good earnest. At *St. Day United* Opies shaft, sinking below the 184, is worth 50*l.* per fm.

At *Great Wheal Busy* the winze below the 130 is reported to be worth 50*l.* per fathom, and three stopes 50*l.* per fathom. At *Hallenbeagle* it is said that in one of the pitches there is a very good course of ore, 3′ wide, solid; and the other pitches are looking well. This mine is likely to make one of the best copper mines in the county, as it joins Wheal Rose on the east, where they have four ends driving, worth from 50*l.* to 90*l.* per fm.; the length of Hallenbeagle sett is four times that of Wheal Rose and on the same lodes; four men in four hours, took away four tons of ore, and these tributers will probably make a "a start" of nearly 400*l.* At *Great North Downs* King's boundary shaft is worth 40*l.* per fm., the winze below the 57 30*l.* per fm., and the 57 west 15*l.* per. fm.

Among lead mines *Cargoll* is looking very well; Michell's engine shaft is sunk 6 fms. below the 110, lode worth 30*l.* per fm. for length of the shaft; 110 north of Michell's, from 40*l.* to 50*l.* per fm.; 110 south of Michell's, 25*l.* per fm.; rise in the back of this level, 20*l.* per fm.; 100 fm. level north of Michell's engine shaft, 30*l.* per fm., and looking promising for a further improvement. At *West Chiverton* the 80 east, on Valpy's lode, is worth 100*l.* per fm.; the 80, west of No. 3 winze, 20*l.* per fm.; the 80 west, on Williams's, 100*l.* per fm.; the 80 west, on Elizabeth's lode, 20*l.* per fm. At *Wheal Chiverton* the 40 is now holed to the two shafts. In the engine shaft, sinking below the 40, the lode is of a promising character.

Among transactions at mine meetings may be noticed:—At *Falmouth and Sperries* special meeting it was resolved to confirm Captain Kitto in

the management. At *Par Consols* meeting (on July 5th) it was resolved to apply to the lords for a reduction of the dues. At *Stray Park* meeting (on July 13th) it was resolved to apply to the Dolcoath adventurers for permission to communicate with the Dolcoath workings, and to use their man-engine for the purposes of the mine upon payment of a fair remuneration. At *Gurlyn* meeting (on July 19th) it was resolved to sell the mine.

Among new companies brought out during the month have been:—The *Great Wheal Bonnie Tin* Mining Company (Limited), with a capital of 50,000*l.*, in shares of 5*l.* each, has been formed for working the tin mine of that name at St. Austell, Cornwall, together with some deposits of china-clay. The purchase-money is fixed at 6,500*l.*, half in shares, with 3*l.* paid, and the remainder in cash. The *South Saint Ives Tin and Copper* Mining Company (Limited) has issued its prospectus. The property to be worked is situated in the St. Ives mining district. The capital is 15,000*l.*, in 6,000 shares of 2*l.* 10*s.* each, with a deposit of 5*s.* per share on application and 10*s.* on allotment. The directors have purchased the sett for 5,000*l.*; 3,000*l.* in cash and 2,000*l.* in paid up shares. *Wheal Penrose Silver Lead* Mine is to be worked by a cost-book company, in 1,024 shares, upon which 2*l.* per share is payable on allotment. Mr. John Hunt undertook the working of the surface refuse and lodes above the adit some four years since. A steam-engine, &c., are now required, and it is to obtain the necessary additional capital that the cost-book company has been formed. The working accounts show a debit balance of 1,184*l.*, and Mr. Hunt agrees to transfer his interest in the sett (which includes Wheal Penrose and Wheal Unity) upon being paid the debit balance—750*l.* of which is to be paid in cash, and the rest in 200 shares with first call only (2*l.* per share) paid. The *Wheal Prudence Copper* Mining Company, with a capital of 25,000*l.*, in shares of 1*l.* each, propose working some mines in St. Agnes parish. The *Cornubia Tin* Mining Company (Limited), with a capital of 36,000*l.*, in 12,000 shares of 3*l.* each, has been formed for the purpose of reworking the mine of that name. The *Cardinham Wheal Rose Silver-Lead* Mining Company (Limited), with a capital of 20,000*l.*, in shares of 1*l.* each, propose working a silver-lead mine formerly known as Wheal Glynn.

WALES AND THE BORDERS.

South Wales.—During the early part of the month, the iron trade appeared to be rather improving, but latterly the want of rain has caused serious inconvenience, and stoppages at many of the works. The Staffordshire ironmasters' meeting has unfavourably affected the trade in this district, and buyers also continue to hold back until more positive information arrives concerning the American tariff.

The *Hirwain* works are reported to be steadily progressing. It is stated that the *Pontnewynydd* forge is likely to change hands again in consequence of some disagreement among the shareholders; and it has also been reported that Mr. Crawshay Bailey, M.P., intends disposing of the *Aberamman* ironworks.

The coal trade has been very generally active, but the demand has not been so great as it was a few weeks back, still the advance in prices has been fully maintained. The colliers in the *Aberdare Valley* have again quietly settled down, but in consequence of their irregularity in working, combined with several other circumstances, the get of coal during the last quarter was found by the official returns to be 30,000 tons less than during the previous quarter, although the demand had been extraordinarily brisk. Coke has not been in such active demand, owing to the blowing out of many of the Staffordshire blast-furnaces.

A considerable quantity of coal has been already raised from the Bedwas pit of the *Machen* Company, and the branch railway communicating with the colliery is rapidly approaching completion. It is reported that the sale of Messrs. Powell's collieries to Messrs. Brassey, Elliott, and Potter has been completed.

During the month of June 111,824 tons of coal, 15,418 tons of iron, 1,733 tons of patent fuel, and 1,786 tons of coke were exported from Cardiff, against 106,996 tons of coal and 15,000 tons of iron in the previous month being an increase of nearly of 5,000 tons of coal and 418 tons of iron. The slight increase is attributed principally to the reopening of the West Bute Dock for traffic. The total number of ships engaged in the foreign trade was 348, being an increase of 65 on the previous month. The West India Islands, as usual, took the largest quantity of coal, no less than 21,013 tons having been cleared for the West India ports. The East Indies and China took 7,521 tons, Italy 13,163 tons, Spain 16,319 tons, France 12,849 tons, the English colonies 8,471 tons, Egypt and North Africa 6,945 tons, South America 5,762 tons, and North America 2,298 tons. A large coasting trade was also done during the month, and the imports are gradually increasing.

During the month of June, 12,645 tons of coal and 185 tons of coke were exported from Newport, against 11,872 tons of coal and 96 tons of coke in June, 1863. The exports of coal from Swansea reached 43,436 tons, as compared with 44,331 tons in the previous month, and 32,343 tons in the corresponding month of last year. The exports from Llanelly were 10,980 tons, against 15,255 tons in May, and 11,949 tons in the corresponding month. The shipments coastwise from Newport were 47,661 tons, against 57,919 tons in the corresponding month of last year. Swansea 20,214 tons, against 24,305 tons in the corresponding period of last year, and Llanelly 20,000, against 20,393 tons during the same month last year. The iron exports from Newport were 10,558 tons, against 9,286 tons in May, and from Swansea 379 tons. Despite the influence of the new tariff, no less than 2,367 tons of iron were cleared for New York from Newport; 1,914 tons of patent fuel were exported from Swansea. The exports from Neath were 25,377 tons of coal, coke, and culm, against 27,319 tons in the corresponding month of last year, 984 tons of bar iron, and 247 tons of tin plates. The imports were 5,138 tons of iron ore, 3,242 tons of copper ore, and 2,037 tons of pig iron.

The imports into Swansea include:—515 tons of iron ore from Santander, 835 tons from Cherbourg, and 504 tons from Bilbao; 642 tons of pig-iron from Antwerp, 230 tons from Dordrecht, and 165 tons from Dordt; copper ore from Wallaroo, Caldera, Cherbourg, and St. Jago de Cuba; nickel ore from Kragers; silver ore from Caldera, and copper and silver regulus from Caldera.

A new company has been formed, called the *Ebbw Vale* Company with a capital of 4,000,000*l.*, in shares of 50*l.* each. The property includes the Ebbw Vale, Sirhowy, Victoria, Abersychan, and Pontypool Collieries and Ironworks. The purchase money is fixed 2,100,000*l.*, of which 300,000*l.* is to be paid in two months, and the remainder by six equal half-yearly instalments.

GLOUCESTERSHIRE AND SOMERSETSHIRE.—A general meeting of the members of the tin plate trade has been held at Gloucester. Mr. Woodruffe, of the Machen Works, Monmouthshire, occupied the chair, and a considerable discussion took place as to the present position and future prospects of the trade. The reduction in the price of tin and the slight decline in iron enable makers, it was said, to quote lower prices to some extent. The American tariff was the principal point of interest referred to, and a general opinion was expressed that, instead of a reduction in the tariff, the probabilities were that it would be virtually increased by the

ad valorem principle being abandoned and quite a different and less advantageous system adopted of charging the duty. Upon the whole, the trade was reported to be not in quite so good a state as at the time of the last meeting, although there was no room to complain, taking into consideration the troubles in America, the high rate of discount, and other matters.

An accident occurred on July 25th, at *Wheatsheaf* Colliery, Pendlebury, resulting in the death of one man, and serious injury to another.

The imports into *Bristol* include:—70 tons of brimstone from Catania; 544 tons of sulphur from Arklow, and 132 tons from Liverpool; 5,544 bars of iron from Stockholm; 70 tons of lead ore from Aberystwith; and 15 tons of iron from Rotterdam. During June, 1,610 tons of coal and 1,406 tons of iron were exported oversea from Bristol, against 712 tons of coal and 1,310 tons of iron in May, showing an *increase* of 898 tons of coal and 96 tons of iron. Compared with the corresponding period of last year the *increase* in the shipments has amounted to 560 tons of coal, and 604 tons of iron.

The imports into *Gloucester* include:—43 tons of iron from Swansea; 95 tons of coal from Landshipping, 135 tons from Milford, and 35 tons from Llanelly. The exports have been:—336 tons of coal; 367 tons of iron, and 203 tons of burnt ore.

The *Lydney Iron Mining* Company, with a capital of 25,000*l.*, in shares of 5*l.* each, has issued its prospectus. The object of the undertaking is to work the Old Park Mine, and the Slope Pit Gale, near Braen, in the Forest of Dean, and within three miles of the shipping port of Lydney.

North Wales.—The following new undertakings have lately been announced. The *Moel Tecwyn and Gwndwn Freehold Gold* Company, with a capital of 60,000*l.*, of which half is to be first issued in shares of 25*l.* each. Its object is to purchase or rent mineral properties in the gold-bearing district of North Wales. The *Caegwernog Gold Mining* Company, with a capital of 50,000*l.*, in shares of 5*l.* each, formed for working a property, containing gold and silver bearing veins, 190 acres in extent, and adjoining the Cefn Coch, in Merionethshire, and comprising most of the veins of that Company. The vendors are to receive no money payment whatever, all existing rights in the property having been secured for 4,000 paid-up shares, so that 30,000*l.* will be available as working capital. The *Flintshire Oil and Cannel* Company, with a capital of 500,000*l.*, in shares of 50*l.* each, has been formed for the purpose of purchasing the entire works, business, and freeholds of the Mineral Oil Company's Works, at Saltney, and of the Tryddyn Oil and Coke Company. The purchase from the Mineral Oil Company also includes an existing contract, which will entitle this company to a supply of 100 tons per day of "Curly" Cannel, from the Leeswood Green Colliery, for twenty-two years from 1860. The purchase-money is fixed not to exceed 160,000*l.*, and the Tryddyn Company have agreed to take their full purchase-money in shares of the new company.

Isle of Man.—The *Isle of Man Slate Quarry and Gold Mining* Company, with a capital of 160,000*l.*, in shares of 1*l.* each, has issued its prospectus. The property includes the Glenruchen and Dalby Slate and Slab Quarries, and extends over 6,906 acres. The prospectus of the *New Laxey Mining* Company, with a capital of 18,000*l.*, in shares of 3*l.* each, has also been issued. The mine and plant is to be transferred to the company for 2,950 shares with 2*l.* paid, and about 650*l.* to pay off the liabilities to the end of May, from which date the present company take possession. The mine is in full working order, and provided with powerful and efficient machinery. The sett is under the same management and adjoins Great Laxey.

MIDLAND COUNTIES, SOUTH LANCASHIRE, AND SOUTH YORKSHIRE.

STAFFORDSHIRE AND WARWICKSHIRE.—In the early part of the month little business was done, both buyers and sellers waiting for the result of the quarterly meetings, and since they took place the iron trade has been in a very disturbed state. Excepting for plates there is little inquiry for finished iron, and merchants at present show little disposition to send in orders. There is a very general feeling that this state of things cannot last long, and it is expected by many experienced men that a good demand will soon set in, and that prices will be firmer, especially when the present rate of wages is taken into account.

The quarterly meetings of the *Staffordshire Ironmasters* have been held during the month. At *Wolverhampton*, on the 13th, there was a large attendance, but the business transacted was on a very moderate scale; this was mainly attributable to the fact of everything being unsettled so far as regards the future prices, the meeting held a fortnight ago having been practically without any result in that respect. It was stated in the course of the day that some half-dozen firms are determined to adhere to the price fixed on the 31st of December last, and that they have orders sufficient to keep their works in full operation; but an influential section of the trade was in favour of a reduction, seeing the very great mistake that was made in raising the price of iron as high as it has been of late. Besides, underselling has prevailed to a great extent during nearly the whole of last quarter, and is more likely to increase than otherwise, so that whatever other questions might be involved there appeared little doubt that the most effectual means of restoring the trade to a healthy action would be to reduce prices to something like a natural level. Even now there is a very fair demand for finished iron, and contracts are only withheld because of the anomalous condition in which the trade is in as regards prices.

The firms who have an American connexion are very fairly supplied with orders, notwithstanding the high tariff, and there is a little more being done on account of the East Indies.

The market for pig-iron was extremely dull; very few sales were reported, and prices ruled low. A large number of the furnace-men are out, but as there are considerable stocks of "pig" at the works, no anxiety on that account is felt. The Shropshire makers report the trade steady in that quarter, and the price well maintained.

The principal meeting was at *Birmingham*, on the 14th, when there was a very large attendance, and so much confusion and excitement as has seldom been experienced on an occasion of the kind. Immediately after the assembly had met it was intimated that the price of Shropshire pig-iron was reduced 10*s.* per ton. It was announced that Mr. William Orme Foster had resolved to reduce the price of finished iron 1*l.* per ton, making Staffordshire bars 8*l.* 10*s.* instead 9*l.* 10*s.* It was stated, also, that Messrs. Knight and Co., of Wolverley, had come to a similar determination. These declarations produced the utmost consternation, but that this was the proper course to pursue there are few who have any knowledge of the state of the trade at this moment will not readily admit, and had the step which has now been taken been adopted at the preliminary meeting the trade would have settled down steadily at once, and orders which have been withheld would have come in freely As matters now stand all is confusion: there was scarcely any business done to day, but the prevailing opinion was that the trade will now recover itself speedily, and that orders will be given out forthwith. Of course, there is no alternative for those who stuck out for the old prices at the preliminary meeting but to follow the example of Mr. Foster and reduce, so that the reduction will soon be general, and applicable to all descriptions of finished iron.

In Staffordshire pig-iron scarcely any business was done at this meeting. At the reduction above announced in Shropshire pig, the price of cold-blast iron of that district is 5*l.* per ton; hot-blast, 4*l.* 5*s.*

At the *Dudley* meeting, on the 16th, the attendance was small, and very few transactions were reported. It was generally understood that the reduction of 1*l.* per ton on the various descriptions of finished iron will be accepted by the trade; indeed, it would be next to impossible for even the makers of favourite brands to stand out. At the same time, so much confusion prevails, consequent on the proceedings at the Birmingham meeting, that some time will necessarily elapse before matters settle quietly down. Something will have to be done about wages, and a suggestion was made that the chairman of the association should call a special meeting on the subject.

A large number of the furnace-men employed on that side of the district are out on strike, but the stocks of pig-iron are ample and the prices low; so that the pigmasters are not embarrassed at the step which the men have taken. All the large works are in full operation, and the new one in course of erection by Lord Dudley is rapidly approaching completion.

The strike of the colliers and furnacemen in the Dudley district has been exercising a favourable influence upon the coal trade in the Wolverhampton district. Certain of the blast-furnace proprietors and finished iron makers in the district being unable to get all the fuel they want from the sources usually open to them at their own doors, have been resorting to the best substitute that the thin-coal district will yield them. In consequence, a few really good sales have been made at prices which would make the quotations in the open market 9*s.* per ton, free on board, for furnace coal. The demand for pig iron is so small that some makers who are determined to keep up prices at something like a remunerative level are continuing to reduce their make, whilst others are increasing their stocks. Makers of finished iron refuse to purchase whilst their requirements are so restricted as during a period when men can scarcely remain at the furnaces. The men are not very anxious to work in such weather at a time when wages are so high as at present, and they are opposed to making more puddled bars than are required to keep the mills going. The men who are employed at the Cradley Works have determined to strike in the event of their employers requiring them to accept a reduction of 1*s.* per ton for which they have given them notice.

Derbyshire.—The iron trade is in a very satisfactory condition, and there is an increasing demand for the make of this district as the good qualities of the iron become more known. The reports from the various lead mines are also pretty good. In the coal trade an excellent business has been carried on for some little time past, and various works are extending their operations. The *Clay Cross* Company have increased the wages of their men 10%. An explosion occurred in the beginning of July, at one the *Dunstan* pits, which injured two of the workmen.

South Yorkshire.—The iron trade continues very active, and there is nothing of any fresh importance to notice.

From a document published by the men engaged in the "lock-out" of the *Leeds* iron trades, it appears that the nine weeks' strike has cost them 6,746*l.* That amount has been distributed to the men locked out during the period named. The *Gateshead* executive contributes 3,544*l.* of this sum. The balance in hand is now liitle more than 62*l.*

The coal trade has also been very brisk, and there seems every probability of the strike and lock-out coming to an end, most of the collieries having their full complement of men.

South Lancashire.—There is scarcely any alteration to notice in the iron trade of this district. The reduction of prices at the Birmingham

quarterly meeting caused some little excitement, but some of the makers had already lowered their rates.

The coal trade has on the whole been brisk, and prices have been fully maintained, though latterly there has not been much doing in house coal as is usual at this time of year.

An accident took place on July 1st, at a colliery near Wigan belonging to Mr. Samuel Stock. In lowering the men into the pit, the cage in which they were came in collision with something in the shaft, and six men were thrown into the water at the bottom of the shaft and drowned.

NORTHERN COUNTIES, NORTH LANCASHIRE, AND NORTH YORKSHIRE.

NORTHUMBERLAND AND DURHAM.—The iron trade continues to make great progress. Old works are being extended, and new ones set on foot, more particularly in South Durham and Cleveland. There are forty-six furnaces near Darlington, producing annually 350,000 tons of pig-iron, and twenty-three more are in course of erection, which when finished will be of much larger dimensions than those now in blast. The total quantity of pig-iron made in the Cleveland district amounts to nearly 1,000,000 tons per annum. Iron shipbuilding is being rapidly developed on the Tyne, Wear, at the Hartlepools, and on the Tees, and this causes a steady demand for iron-plates. New iron shipyards are being established, and wooden shipbuilders are gradually adapting their premises to the employment of the new material. In consequence of the greatly increased importance and the continued expansion of the Cleveland iron trade arrangements have been made for establishing a daily iron market at Middlesborough, and providing satisfactory store warrants.

The coal trade just now is more than usually active, the recent order from the Admiralty having given a considerable stimulus to the north country steam collieries, while the other collieries have been full of orders for some time past. In the coking colliery districts the supply falls far short of the demand, and ironmasters all over the kingdom are seeking long contracts in order to ensure continuous supplies. The price of coke in consequence has gradually advanced, the principal cause of its present high price being the rapid development of the Cleveland iron trade, and the falling off in the supplies hitherto derived from the Staffordshire coal field. It is stated that new shafts are being sunk at *Castle Eden* and *Coxlodge* Collieries; at the latter colliery this is the second within a short period, and it is expected that it will place the works on a very good footing.

On July 4th, in accordance with previous arrangement, a deputation of the miners of *Adelaide* Colliery waited upon J. Pease, Esq., at the office in Darlington, for the purpose of discussing their claims to a further advance of one shilling on the "score price." It appears that the men at this colliery had been earning on an average 3*s.* 11½*d.* a-day, and some of them had been making 5*s.* 6*d.* a-day. It is said that the colliery had been "hung on" for about a fortnight, and the men might have wrought during the whole of that time had they felt disposed; but they did not do so, to the consequent detriment of their employers. The miners were represented by four of the workmen at the above colliery. The question of wages was fully discussed, and although the men were bound to get coal at a certain price per score for twelve months, yet Mr. Pease gave an advance of 6*d.* per score to those who use lamps, and of 3*d.* per score to those who work with candles.

The exports from the Tyne include:—90,186 tons of coal, 2,877 tons of coke, and 45,390 cwts. of iron. The imports include:—20 cargoes of pyrites, and 50 tons of bar iron.

SCOTLAND.

The coal trade has been dull as far as regards the home consumption, but there has been a steady demand for export. The shipments from the various ports during the last four weeks show on the whole a slight increase as compared with those during the corresponding period of last year.

During the first part of the month the market for all kinds of iron was very quiet, but since the first class makers reduced the price of bar-iron 10*s.* per ton, a better demand has set in, and a good many orders have been received. There has also been a good inquiry in the export trade.

The shipments of Scotch pig-iron during June, foreign and coastwise, show a slight depression as compared with the corresponding month of 1863, the progress which had been observable hitherto this year having thus sustained a check. The total shipments for the first six months of the last four years have been as follows:—

Month.	1864.	1863.	1862.	1861.
	Tons.	Tons.	Tons.	Tons.
January	38,476	30,467	44,729	39,267
February	45,843	38,807	39,614	33,070
March	61,525	50,909	44,495	33,474
April	76,176	70,995	66,975	77,356
May	64,698	54,170	56,646	67,302
June 4	13,345	11,629	10,829	15,313
„ 11	14,549	13,840	8,695	14,709
„ 18	12,511	12,344	13,224	12,736
„ 25	12,614	16,005	9,419	14,443
Totals	339,737	299,216	294,626	305,670

The shipments in June were thus 53,019 tons against 53,808 tons in June, 1863; 52,167 tons in June, 1862; and 57,201 tons in June, 1861. The shipments of the first six months of 1864, are shown to have been 40,521 tons in excess of those in the corresponding period of 1863; 45,111 tons in excess of those in the corresponding period of 1862; and 34,067 tons of those in the corresponding period of 1861.

CONTINENT OF EUROPE AND MEDITERRANEAN COUNTRIES.

FRANCE.—The iron trade of *St. Dizier* continues very inactive, and there have been many complaints as to the scarcity of orders; prices have, however, been pretty well maintained. In the *Moselle*, M. Barbe of Nancy, in conjunction with a Belgian company, is about to construct some new blast-furnaces. It is expected that three furnaces will soon be in blast at *Pont-à-Mousson*, and it is said that nearly 4,000*l.* has been expended in the erection of powerful blowing apparatus. Only one establishment is in operation at *Noveant*. At *Ars*, the forges of MM. Karcher and Westermann and those of MM. Dupont and Dreyfus present a marked development; there are now seven or eight blast furnaces at work here. The large firm of Wendel, at *Hayange*, is erecting eight blast-furnaces adapted for a very large production. An old blast-furnace is being re-mounted at *Ottange*, and a new one of large dimensions has also been constructed at the same place. Some well-situated works are at present inactive at *Herserange*

and *Moulaine;* but hopes are entertained that they will be turned to account before very long.

A report lately presented to the shareholders in the *Société des Hautes Fourneaux de Marseille et des Mines de Portes et Senechas* states that the working of 1863 showed a profit of 34,736*l.*, which enabled a dividend of 17*s.* 3*d.* to be distributed on the shares. Of this sum 8*s.* per share was paid on account on Aug. 1, 1863, and the balance of 9*s.* 3*d.* per share will become payable on Oct. 1, 1864.

It is stated that the *Marly* Colliery, in the department of the Nord, has been re-opened. The *Escarpelle* Company are about to commence working a new pit, the land for which has already been purchased. The use of coke is greatly on the increase, many of the works now employing it mixed with other fuel, particularly in the *Blaise* district.

The *Grand Combe* Coal Company has published its report for 1863 from which it appears that the total production of these mines for that year amounted to 493,000 tons. The net profits were 61,982*l.*, which, added to the balance already in hand, left a credit balance of 89,343*l.*, out of which a dividend of 2*l.* 12*s.* per share (62,400*l.*) was declared.

BELGIUM.—The iron trade in this country is reported to be in a satisfactory condition, and the demand for exports is increasing. A contract has lately been concluded between Messrs. de Dorlodot Brothers and a French house to supply the latter with 3,600 tons of rails at 7*l.* 4*s.* per ton. The *Strepy-Bracquegnies* Company intend shortly, it is said, to light a second blast-furnace. MM. Gillieaux and Co. are about to establish some iron works at Marchienne-au-Pont. The rolling works of the *Centre*, formerly belonging to MM. Vanseveren and Co., have been sold for 8,240*l.*, to MM. Englebienne and Co. The *Montigny-sur-Sambre* Company is about to add some additional apparatus to its rolling works. A foundry, which the *Trieu Kaisin* Colliery has recently established in the neighbourhood of Châtelineau, has commenced operations.

Among recent dividends announced may be mentioned those of the *Charbonnages du Nord de Charleroi*, fixed at 1*l.* per share, and payable in moieties June 30 and December 31, 1864; of the *Charbonnages du Val-Benoit*, at Liége, fixed at 12*s.* per share for the year 1863–64; of the *Thy-le-Château* Blast-furnaces and Foundries Company, fixed at 7 per cent. for the year 1863; of the *Sclessin* Blast-furnaces, Ironworks, and Collieries Company, 5 per cent., or 13*s.* per 13*l.* share for the year 1863–64; of the *Lavoir* and *Blanc-Misseron* Mines and Ironworks Company, fixed at 6*s.* 8*d.* per share; of the *Nouvelle-Montagne* Company, 1*l.* 4*s.* per share, payable December 20; of the *Belgian* Company, for the manufacture of steel, 12*s.* per share; of the *Horme* Foundries and Forges Company, balance of the dividend for 1862–63, of 1*l.* 12*s.* per share; of the *Lead and Zinc* Mines and Foundries Company of Stolberg and Westphalia, for the year 1863, of 18*s.* per preference share, and 3*s.* per old share; of the *Royal Austrian* Mining Company for the year 1863, 5*s.* 10*d.* per share.

NORWAY.—A prospectus has been issued of the *Norwegian Charcoal Iron* Company, with a capital of 150,000*l.*, in shares of 20*l.* The object is to purchase the Eidsfoss Ironworks, with adjacent mines, and to increase their capacity of production to 15,000 tons per annum. The price of the entire property, comprising more than 16,000 freehold acres, and also stock-in-trade valued at 20,000*l.*, is 80,000*l.* of which 15,000*l.* is to be in deferred shares, while the extensions and improvements will amount to 35,000*l.* Some of the leading persons connected with iron and steel works at Sheffield and Manchester are members of the Board, and one half of the capital is already subscribed. It appears from statements furnished that the valuations of the property and the estimates of its future results have been framed with honesty and care.

The Company referred to in our last as being about to purchase the property of the East Kongsberg Native Silver Mining Company has issued its prospectus. It is called the *Silver Mining Company of Norway*, and its proposed capital is 150,000*l.*, in 60,000 shares of 2*l.* 10*s.* each.

SWEDEN.—In the year 1863 the production of copper at the Fahlun mines amounted to 14,600 ctrs. (730 tons). For some time past the argentiferous and auriferous black copper has been treated with sulphuric acid. From 6 to 7 ctrs. of copper are treated per day, containing about 50 lbs. of gold, and four times that quantity of silver. Large sulphuric acid works are shortly to be constructed.

A new undertaking has lately been announced under the title of the *Robertsfors Ironworks* Company (limited), with a capital of 300,000*l.*, in shares of 20*l.* each, the object of which is to purchase Robertsfors and Fredriksfors estates, comprising 150,000 acres of freehold and Crown land, with forests, ironworks, and shipbuilding yards. The property is about five miles from the harbour of Sikea, in the gulf of Bothnia. Arrangements will also be made for carrying on the manufacture of Bessemer steel. The purchase money will be about 70,000*l.*, the vendors agreeing to accept 50,000*l.* for the estates, and the stock in trade and iron in store will be taken at a valuation, which will be about 20,000*l.* more.

SPAIN AND PORTUGAL.—The *Peninsular Gold Mining and Washing* Company, with a nominal capital of 100,000*l.* in 50,000 shares of 2*l.* each, has issued its prospectus. The object of the company is to purchase and work certain gold quartz mines in Spanish Estremadura, and about 5,000 acres of alluvial gold deposits in Portugal, near the village of Rosmaninhal, on the north side of the River Tagus. The purchase-money is 13,000*l.* in cash, and 16,000 shares in the company, with 1*l.* per share paid.

NORTH AMERICA.

CANADA.—The *Quebec Chronicle* states that very contradictory reports are being received from the *Chaudiere* gold diggings. There is no doubt that gold is there, but it is very difficult to find it in paying quantities. Mining operations are very much restricted by the exorbitant prices demanded for "claims," and men are leaving the district faster than others arrive, so that but little is really known as to the true capabilities of the district.

NOVA SCOTIA.—The *Nova Scotia Land and Gold* Company have received advices which state that a new lode has been discovered, about 3" wide and very promising.

LAKE SUPERIOR REGION.—Mining operations in this district are, it is reported, being vigorously pushed on, although some inconvenience is being felt at the scarcity of miners. *Etna* mine is said to be opening up very well, and preparations for the erection of a stamp mill are being carried on as actively as possible. The directors have made a call of $1 per share, in order to provide ample machinery, buildings, &c. At *Girard* the main shaft, now 40′ deep, is reported to be improving steadily, and other parts of the mine looking well. *Empire* mine is also said to be looking very promising. The directors of the *Amygdaloid* Mining Company have published their annual report, in which it is stated that, notwithstanding the scarcity of labour, and the high prices of materials, good results would have been shown but for the fire which destroyed the stamps-house and most of the surface works, and this, besides necessitating the construction of new buildings, prevented any copper being returned.

An American paper states that the *Mineral Land* Company have disposed of all their lands in *Marquette* county to the Peninsula Railroad

Company. It is known that large deposits of iron ores exist on these lands, and it is expected that much more will be developed. There is also timber on the property sufficient for three or four blast-furnaces.

UNITED (ATLANTIC) STATES.—The *West Pittston Coal* Company have struck a seam of coal 7½′ thick, 5½′ of which is of superior quality, at a depth of 185′ from surface, on the west side of the Susquehanna river, thus proving the existence of workable seams of coal through the whole length of *Wyoming Valley*, a question which has hitherto been a doubtful one.

CALIFORNIA AND BORDER TERRITORIES.—Up to June 11th, $6,305,136 more of treasure have been shipped from California than was shipped up to the same period of last year.

The first powder made in California has been turned out from the *California Powder* works near Santa Cruz.

Another new and extensive iron foundry is to be erected in *San Francisco*, by the Vulcan Iron Works Company, which have been duly incorporated, with a capital stock of $250,000, in $100 shares.

The *Gould and Curry* Company are about to change the process of reduction in their mill from the dry to the wet method. They are now engaged in the erection of six large patio platforms, to be used in working the tailings from the mill. The amalgamation will be effected in the tortas without the aid of the wooden wheels commonly used.

A species of lignite coal has been discovered on Mr. Black's ranch, just west of *Salt Spring Valley*, a short distance north of Copperopolis. This discovery of coal in the immediate vicinity of the principal copper mines is a matter of great importance. Should coal be found there in any considerable quantity, it must add vastly to the value of the copper interest.

The *American* Mining company at Sebastopol, Nevada county, after a run of 12 days, cleared up the sum of $25,000 (5,000*l*), An American paper estimates that during the past year the lead mines in *Virginia*, Nevada Territory, produced enough for ten millions of ounce balls.

The movement to make greenbacks currency in Nevada Territory has received a decided check at Virginia City, a large meeting having unanimously declared in favour of the gold and silver basis. The yield of thirty-seven silver mines in Nevada Territory is estimated at $1,000,000 per month, of which the Gould and Curry furnishes $450,000.

The work of development on the mines at *Reese River* appears to be steadily going forward, and with the most flattering results. Thus far, almost without exception, the mines of that region have improved with depth, both in their yield and in the size of the veins. As a general thing the expensive process of tunneling is dispensed with and the veins are opened by sinking inclines down upon the leads. The deepest incline, thus far, we believe, is on the North Star, which, at last accounts was down 200′ or 150′ perpendicular. The vein was found continuous and productive the entire distance.

The *Blue Gravel* claim (placer) at Smartsville, cleared up, after a run of two weeks of their mill, the sum of $44,000. The *Yuba* Company have recently remitted 78 oz. of gold, the result of 6¾ days' working of rock from their ledge, worked at the Pennsylvania mill, Brown's Valley, Yuba county.

The river mines throughout the State all promise well for a longer summer's work than they have had for some years. Scott River is receding very fast, and the miners will soon be in the stream, for the longest summer's work, probably, that has ever been known on that river.

An increased activity is beginning to be observed among the miners in the vicinity of *Austin*. In the *Canon*, the mill men are generally engaged in making improvements for the more thorough working of the ores. The

furnaces and chimneys are being built of stone, the fire-place and arches will be constructed of fire-brick, manufactured in Upper Austin for the purpose. The first rock to be worked in them will be from the Maggie lode. In a few days the mill will commence work on the rock from the Whitlatch of Yankee Blade. The *Rhode Island Mill* Company are also erecting roasting furnaces, and are making preparations for more improvements.

The *Open Sesame Gold and Silver* Mining Company have determined to erect a mill near their mine at Mount Diablo, immediately. An immense smelting furnace is being erected above *North Point Dock*, San Francisco, which will be used for the purpose of reducing copper ores. Rock of extraordinary richness has been struck in the old Ural shaft, belonging to the *Del Monte* mine. The Ural Company had missed it when going down. The lead is said to be about 3½′ thick, showing a great deal of gold.

It is stated that there is a sufficient amount of rich rock now lying in *El Dorado Canon* on the Colorado, to employ a dozen or more 40-stamp mills for six months.

The *Los Angeles News* has intelligence from Catalina Island, to the effect that mining operations are progressing very satisfactorily. A silver and galena bearing lode and a copper mine, are among the recent discoveries.

Large discoveries of silver are reported to have been made on *Silver Creek*, a tributary of Walker river, in Lost Valley district.

The coal found some time since in *Lyon County*, Nevada Territory, and about nine miles from Dayton, is reported to improve as the mine is worked. It has been tried in a blacksmith's forge and is said to be superior to charcoal, answering all the purposes of welding, &c. It will probably be brought into general use.

MEXICO.—It is reported that a valuable discovery of tin has been made near *Durango*, and that there is an abundance of wood for smelting and building purposes, as well as water in the vicinity. The ground has been taken up and located by a San Francisco party, and is to be worked by a company to be called the *Durango Mining and Land* Company.

SOUTH AMERICA.

TRINIDAD.—The prospectus has been issued of the *Trinidad Petroleum* Company (limited) with a capital of 150,000*l.* in 7,500 shares of 20*l.* each, the object of which is the importing of petroleum from Trinidad, produced on lands to be purchased by the Company.

BRAZIL.—From *St. John Del Rey* the directors have received the following advices: Produce for May, 16,788 oitavas; cost for May, 10,747*l.*; loss in May, 4,112*l.* Ten days in June, 5,357 oitavas; yield, 3,156 per ton.

From *Don Pedro North Del Rey*, Capt. Thomas Treloar reports that the produce for May amounted to 1,267 oitavas, being 114 oitavas more than that in April. Operations generally were progressing satisfactorily.

The *Santa Barbara Gold* Mining Company have received advices from Captain Bryant, dated Pari, May 27th. Produce from 20th of March to 20th of April, 1,089 oitavas; ditto from 20th of April to 20th of May, 1,232 oitavas; being an increase of 143 oitavas in May; total gold on the mine, 2,321 oitavas. There are no alterations in the mine to notice.

AUSTRALASIA.

VICTORIA.—The Report from *Port Philip and Colonial*, states that the quantity of quartz crushed during April, was 2,615 tons, with a yield of

942 oz. 12 dwt. of gold, or an average of 7 dwt. 5 gr. per ton. The receipts for the same period were 1,632*l.*, and the payments 1,199*l.*

South Australia.—The directors of the various Australian Mining Companies have received advices up to May 27th. From *Kapunda* it is advised that the quantity of ore raised in March, was 280 tons, of 16½°/₀ average produce, equal to 46½ tons of pure copper, exclusive of 60 tons of sulphur ores for flux. The quantity raised in April is estimated at about 360 tons wet weight, and of good percentage. The exploration of the ground in which the branch of ore was discovered is progressing; but although the manager's expectations were favourable, no definite result had yet been arrived at.

From *English and Australian Copper* it is reported that the stock of coal at Kooringa was 3,000 tons, at Kapunda 863 tons, and at Port Adelaide and afloat 2,546 tons. At Port Adelaide there were six furnaces at work melting and roasting, and one refinery. The winter operations at the Burra works would be commenced early in July.

The report from *Yudanamutana* states that the mines continue in a satisfactory condition. The smelting is also going on satisfactorily.

At *Wheal Ellen* there is an improvement in the 40 fm. level.

Western Australia.—From *Fortune* advices state that in the 40 fm. level the lode, though at present unproductive, presents very favourable indications. It is also reported that a lode has been discovered in the new sections recently purchased.

Record of the Mining and Metal Markets.

METALLIC-ORE MARKETS.

Tin.—The standards for black tin have been reduced 2*l.* since our last, and now stand at :—

Superior Fine	.. £101	Superior Common	.. £97
Second Fine	.. 99	Second Common	.. 96

The *West Briton* states that notwithstanding this decline there is a better feeling in the trade, and a general impression prevails that no further reduction in the standard is at present contemplated.

Copper.—At the five Cornish sales we give this month the number of tons, average produce, quantity of fine copper, average price per ton, and standard have been as follows:—

Date.	*Tons.*	*Produce.*	*Fine Copper.* Tons. cwt.	*Price per ton.*	*Standard.*
June 30 ..	3,640 ..	6¼ ..	229 16	£4 19 0	£123 11 0
July 7 ..	3,004 ..	7⅛ ..	215 0	6 2 0	123 13 0
„ 14 ..	2,252 ..	6⅜ ..	143 16	5 10 6	129 10 0
„ 21 ..	5,503 ..	5⅞ ..	322 18	5 4 6	136 0 0
„ 28 ..	3,379 ..	6⅜ ..	215 8	5 7 6	127 9 0

At the sale of June 30th, the standard declined 2*l.* according to the *Mining Journal*, but advanced 16*s.* according to the *West Briton*. At the sale of July 7th the advance was 3*l.* 10*s.*; at that of the 14th 2*l.*; and at that of the 21st 2*l.*; at the sale of the 28th the standard declined 3*l.*

Lead.—The prices of lead ore this month show a slight reduction on those of last.

COAL MARKETS.

LONDON, *August 1st.*—From the returns of the Registrar of the London Coal Exchange, of the quantity of sea-borne coal, culm, and cinders, imported into London in the month of July, we learn that the total quantity was 250,886 tons, against 259,817 tons during the corresponding month of last year,—showing a *decrease* of 8,931 tons.

The following are the particulars of the 250,886 tons imported during July:—

Newcastle ..	95,651	tons in	198 ships	Scotland ..	760	tons in	6 ships
Seaham ..	15,058	,,	63 ,,	Wales ..	12,454	,,	26 ,,
Sunderland .	71,859	,,	158 ,,	Yorkshire ..	2,047	,,	25 ,,
Middlesbro'.	7,120	,,	28 ,,	Small ..	2,838	,,	4 ,,
Hartlepool..	41,568	,,	153 ,,	Cinders ..	1,245	,,	10 ,,
Blyth ..	286	,,	1 ,,				

The quantity of coal imported by railways during the month of July was 186 499 tons against 126,274 tons in the corresponding month of last year,—showing an *increase* of 60,225 tons.

The following are the particulars of the 186,499 tons imported during July:—

	Tons.		Tons.
London and North Western ..	70,403	Midland	11,177
Great Northern	62,279	London, Chatham, and Dover	632
Great Western..	20,370	Tilbury and Southend ..	36
Great Eastern	17,807	Other Railways	3,795

On June 30th, the new ships arrived were 22; there was an improvement of 3*d.* per ton in house-coal; Hetton Wallsend, 18*s.*; Haswell Wallsend, 18*s.*; Hartlepool Wallsend, 17*s.* 3*d.*; Braddyll's Hetton Wallsend, 16*s.* 9*d.*; Heugh Hall Wallsend, 16*s.* 6*d.*; South Kelloe Wallsend, 16*s.* 6*d.*; Harton Wallsend, 16*s.*; Hetton Lyon's Wallsend, 16*s.*; Framwellgate Wallsend, 15*s.* 9*d.*; Hasting's Hartley, 16*s.* 3*d.*; Tanfield Moor, 13*s.* 6*d.* On July 1st, new ships 28; a steady demand in the market. On the 4th, new ships 53; house-coal in great demand at a further advance of 3*d.* per ton; Hartley's also risen 3*d.* to 6*d.* per ton. On the 6th, new ships 63; Hartley's advanced another 6*d.* per ton. On the 8th, new ships 32; market steady. On the 11th, new ships 55; market still steady. On the 13th, new ships 40; there was increased firmness in house-coal. On the 15th, new ships 22; house-coal in active request, and advanced 3*d.* to 6*d.* per ton. On the 18th, new ships 18; market quiet. On the 20th, new ships 23; house-coal in demand at an advance of 6*d.* per ton. On the 22nd, new ships 42; a very active demand in the market for house-coal at still higher prices. On the 25th, new ships 117; market active; Hartley's scarce and advanced 6*d.* per ton. On the 27th, new ships 63; business dull. On the 29th, new ships 17; a steady demand for house-coal. Hetton Wallsend, 19*s*; South Hetton Wallsend, 19*s.* Braddyll's Wallsend, 17*s.* 9*d.*; Eden Main, 17*s.* Bute's Tanfield, 13*s.* Hasting's Hartley, 17*s.* 6*d.*

LIVERPOOL.—From Messrs. J. and T. Platt's Coal Circular for June, we find that the quantity of coal, cannel, coke, and patent fuel shipped from Liverpool to foreign and colonial ports during the month of June was 54,853 tons, against 37,917 tons during the corresponding month of last year—showing an *increase* of 16,936 tons. The exports coastwise during June were 17,857 tons, against 8,991 tons during the same month last year—showing an *increase* of 8,866 tons. The total exports coastwise from January to June were 72,142 tons, against 41,790 tons during the corrresponding period of 1863—showing an *increase* of 30,352 tons.

CONTRACTS.—The Admiralty require the supply of 3,500 tons of coal for Jamaica, and 1,000 tons for Sierra Leone, one-third of each to be North of England, the remainder South Wales coal. The South-Eastern Railway Company require 80,000 tons of coking coal.

SHARE MARKETS.

LONDON, *August 1st.*—The almost complete stagnation of the London share market still continues. The amount of real business transacted has been very trifling; and where prices have been other than merely nominal with very rare exceptions they have had a downward tendency.

A prospectus has been issued of the *Mining Financial Association* (Limited), with a capital of 1,000,000*l.* in 40,000 shares of 25*l.* each, one-half of which is to be first issued. Embryo prospectuses of similar schemes have been handing about for several months, in connection with which influential names have from time to time been mentioned; but the present company does not include any such names. The prospectus states that "the object of this association is to facilitate legitimate mining, quarrying, and other mineral enterprises . . . which a large associated capital can alone command;" to which end "the association will buy, sell, and advance upon shares and other interests in mineral property." The prospectus also provides the somewhat peculiar arrangement that "for the convenience of capitalists already engaged in mining enterprise, the shares of any working mining or mineral company whatever, including quarries and other works, will, if approved, be accepted in lieu of cash, in payment of the amount due on allotment, as well as of one or more future calls, upon conditions to be arranged according to the circumstances of each case." It is explained, that "shares thus accepted will be dealt with under the heads of shares in 'dividend paying mines or works,' 'cost paying mines or works,' and 'progressive mines or works,' and the shares of the Mining Financial Association exchanged for these will represent only such a percentage paid up as the position and prospects of the respective mines or works may justify." *A propos* to this concern, the *Times* City article has the following observation: "Considering that there are few species of investment more alluring to inexperienced persons, or that on the average yield a poorer return, than mining properties, it might have been supposed there was little need of a company for its special encouragement." A somewhat similar company (with this difference, however, that it is brought out under the auspices of Messrs. John Taylor and Sons) is the *Mining Shares Investment* Company, with a capital of 250,000*l.* in shares of 10*l.* each, which is mentioned as having had its capital privately subscribed although not yet brought on the public market. Its object is the purchasing, and (where desirable) disposing of shares in profitable mines; it being provided that not more than 5% of the capital shall be invested in any one adventure.

The following have been the principal alterations in prices:—

Declined.

South Frances	£10	New Martha	slightly
Wheal Buller	2	Wheal Crebor	slightly
West Chiverton	10	Cook's Kitchen	£3½
Wheal Chiverton	2½	Stray Park	1
Wheal Trelawny	1	North Crofty	¾
North Shepherds	1¾	North Roskear	3
Wheal Hope	1	New Rosewarne	1½
Wentworth Consols	5½	Pendeen	1
Wheal Mary Ann	slightly	Wheal Uny	slightly
Great Wheal Vor	£3	Great South Tolgus	slightly
East Lovell	2	St. John Del Rey	£3
Great Wheal Busy	1	Yudanamutana	slightly
Wheal Rose	3	Anglo-Brazilian Gold	£⅜
Great North Downs	slightly	Gellivara	slightly
East Caradon	slightly		

Advanced.

East Grenville	slightly	East Rosewarne	slightly
Cargoll	£10	East Carn Brea	£1
Providence	1	Great Laxey	2
Clifford Amalgamated ..	slightly	Rhymney Iron	3½
Hallenbeagle	£1	Ditto New	¾
South Caradon	5	Cape Copper	½
East Russell	slightly	English & Australian Copper	slightly
Devon Great Consols ..	£10	Anglo-Mexican Mint ..	slightly
Carn Camborne	slightly	Nova Scotia Gold	⅛
West Seton	£15		

The largest amount of business has been transacted in *East Grenville* shares, but without much variation in prices. They opened at 5*l*.–5¼*l*., and close at their highest quotation of 5⅜*l*.–5⅞*l*. A fair amount of business has also been transacted in *Wheal Grenville* shares, which opened at 7½*l*.–7¾*l*. and close 7*l*.7½*l*. *Wheal Basset* shares about the middle of the month were quoted as low as 87½*l*.-90*l*. but rallied, and close the same as last month, at 90*l*.-95*l*. *East Basset* 66*l*.-68*l*. *South Frances* shares have declined from 50*l*.-55*l*. to 40*l*.-45*l*. *Wheal Buller* shares were last quoted at 25*l*.-27*l*., being a reduction of 2*l*. upon last month's prices. *West Frances*, 29*l*.-31*l*. *Copper Hill*, 10*l*.-12*l*.

Among Cornish lead mines there has been great depression, and all have shown a downward tendency, with the exception of *Cargoll* shares, which quickly recovered their fall of last month and steadily advanced until the 22nd, when they were as high as 40*l*.-42*l*.; but they close a little lower at 38*l*.-40*l*. There has been a fall of 10*l*. in *West Chiverton* shares, They opened at 65*l*.-70*l*., being a decline of 5*l*. on our last quotations, and close with another fall of 5*l*. at 60*l*.-65*l*. *Wheal Chiverton* shares have also steadily declined all through the month, falling from 9*l*.-9½*l*. to 7¾*l*.-8¼*l*. *Wheal Trelawny* shares still continue to show a downward tendency and were last quoted at 19*l*.-19½*l*. *North Shepherds* shares have declined from 4¾*l*.-5¼*l*. to 3*l*.-3½*l*. In *Wheal Hope* shares there has been a decline of 1*l*. to 3½*l*.-4*l*. There has been a heavy fall in *Wentworth Consols* shares from their opening quotation of 16½*l*.-17½*l*. to 10*l*.-12*l*. *Wheal Mary Ann* shares also close flat at 14*l*.-15*l*. *Great South Chiverton*, 2⅛*l*.-2⅜*l*.

The tin mines of the extreme west of Cornwall have also been very flat. *Great Wheal Vor* shares have receded from 30½*l*.-31½*l*. to 27½*l*.-28*l*. In *East Lovell* shares there has again been a decline. They opened on the 29th at 17*l*.-18*l*., and by the 5th were quoted at 14½*l*.-15½*l*., on the 6th they rallied a little, but declined again on the 14th to 14*l*.-15*l*., at which price they remained pretty steady until the end of the month, when shares advanced to 15*l*.-16*l*. *Providence* shares have again improved, and were last quoted at 39*l*.-41*l*. *Great Wheal Fortune*, 12½*l*.-13½*l*. *Rosewall Hill and Ransom*, 3*l*.-3¼*l*. *Wheal Kitty* (Lelant), 11*l*.-12*l*.

Clifford Amalgamated shares opened on the 29th at 31½*l*.-32½*l*., but, after advancing to 33*l*.-34*l*., close lower at 32*l*.-33*l*. *Great Wheal Busy* shares show a falling off, their closing price being 2*l*.-2½*l*. *Hallenbeagle* shares have improved to 4½*l*.-4¾*l*. There has been another drop in *Wheal Rose* shares from 43*l*.-45*l*. to 40*l*.-42*l*. *Great North Downs* shares are lower at 5*l*.-5½*l*. *Nanjiles*, 27½*l*.-28½*l*.

East Caradon shares have not maintained last month's slight improvement. They opened on the 29th at 29½*l*.-30*l*., and after almost daily fluctuations close lower at 28¾*l*.-29¼*l*. *South Caradon* shares are steady at 460*l*. 470*l*. *Marke Valley*, 5*l*.-5¼*l*. *Gonamena*, 3½*l*.-4*l*. *South Caradon Hooper*, 7*s*. 6*d*. 10*s*.

There has again been a slight advance in *East Russell* shares from 4*l*.-4½*l*. to 4¾*l*.-5*l*. *Devon Great Consols* shares are quoted 10*l*., higher than last month at 570*l*.-580*l*. *New Martha*, 1*l*.-1¼*l*. *Drakewalls*, 1⅛*l*.-1⅜*l*.

Wheal Crebor, 42*s*.-44*s*. *Hingston Down*, 4*l*.-4¼*l*. *New East Russell* which is new on the market, is quoted at 1*l*.-1⅛*l*.

The Camborne Tin Mines are heavy. *Cook's Kitchen* shares have not maintained the advance of last month, but have steadily receded from their opening price of 20*l*.-21*l*. to 16½*l*.-17½*l*. In *Stray Park* shares there has been a decline of 1*l*. to 29*l*.-30*l*. *Tincroft*, 17¼*l*.-17¾*l*. *South Condurrow*, 14*s*.-15*s*. *Carn Camborne*, 28*s*.-30*s*.

Wheal Seton shares opened at 220*l*.-225*l*., and after advancing to 225*l*.-230*l*., and receding to 210*l*.-220*l*., close at their opening quotation. *West Seton* shares have advanced from 205*l*.-210*l*. to 220*l*.-225*l*. *North Crofty*, 3½*l*.-4*l*. *North Roskear*, 17*l*.-19*l*.

New Rosewarne shares close lower at 8*l*.-9*l*. *Wheal Unity*, 5*s*.-7*s*. 6*d*. *Wheal Kitty* (St. Agnes), 6¼*l*.-6½*l*. *East Rosewarne*, 3⅛*l*.-3½*l*. *Pendeen*, 2¾*l*.-3¼*l*. *Treloweth*, 1⅜*l*.-1½*l*. *New Birch Tor and Vitifer*, 2⅛*l*.-2⅜*l*.

East Carn Brea, shares close slightly better at 8⅜*l*.-8⅞*l*. *Wheal Uny*, 5¼*l*.-5½*l*. *South Tolgus*, 37*l*.-39*l*. *Great South Tolgus*, 2½*l*.-3*l*. *North Treskerby*, 1¾*l*.-2¼*l*.

Among Welsh and Isle of Man mines and undertakings *Great Laxey* shares have again improved and are now quoted at 16*l*.-17*l*. *Prince of Wales*, 5*s*.-7*s*. 6*d*. *Rhymney Iron*, 31*l*. *Rhymney Iron New*, 8½*l*.-9½*l*. *St. David's Gold*, 10*s*.-15*s*. *Vale of Towy* shares, which have not been dealt in for a long period, have been quoted at 5*s*.-7*s*. 6*d*. *South Wales Colliery*, 2*l*.

In foreign and colonial shares there is still very little business to report. *St. John Del Rey* shares continue to decline, at one time going down as low as 30*l*.-31*l*. They have since rallied and close at 38*l*.-38¾*l*.-37⅞*l*. *Cobre* shares are not so firm at 34*l*. *Cape Copper* shares have not varied much, but close a little better at 11*l*. *Fortuna*, 3⅜*l*. *United Mexican*, 2⅜. *Yudanamutana*, 2⅜*l*. *Santa Barbara*, 10*s*. *English and Australian Copper*, 1⅜*l*. *Kapunda*, 1½*l*. *Scottish Australian*, 10*s*. *Anglo-Mexican Mint*, 19½*l*. *Quebrada Land and Mining*, 3⅞*l*.-3¾*l*. *Nova Scotia Gold and Land* has improved, shares at one time advancing as high as 3*l*., but closing lower at 2½*l*. *General*, 21½*l*. *Anglo-Brazilian Gold*, 5*s*. *Lusitanian*, 17*s*. 6*d*.-20*s*. *Gellivara*, 1¼*l*.-1½*l*.

Among new undertakings *Ebbw Vale* shares which were quoted on June 30th at 1*l*.-2*l*. prem., have since varied from ½*l*. to 1½*l*. prem., but close lower at ¼*l*. dis.-¼*l*. prem. *South Wheal Lovell* shares have been quoted at 2*l*.-2½*l*. *Great Wheal Bonnie*, ¼*l*.-⅜*l*.

The Committee of the Stock Exchange appointed July 11th a special settling day in the shares of the *Valencia Slate Slab* Company, to be marked only in the twice-a-week list; and August 1st, in the shares of the *Humber Iron Works and Ship Building* Company, to be quoted in the official lists. With regard to this latter company, much confusion has been caused in settling transactions in the shares on the Stock Exchange, owing to certain persons interested in the promotion of the Company, who had bought shares prior to allotment, declining to complete their bargains, under the plea that, according to the new rule of the Stock Exchange, the settlement only applied to transactions entered into since the issue of allotment letters. This course has caused great indignation; but as the brokers through whom the purchases were effected (and who have declared their intention of fulfilling the bargains at their own cost, if necessary) are considered to have a remedy at law against their repudiating principals, it is probable that the affair will be ultimately settled.

CORNWALL.—The mining share market has been very dull, though during the last fortnight it has assumed a somewhat better tone, and prices generally close at a slight advance. *West Seton* shares have improved to 220*l*. *Hallenbeagle* shares were heavy at the beginning of the month and showed a downward tendency, but close stronger at 4¼*l*.

Cargoll shares have been in good demand and advanced at one time 42*l.*-43*l.*, but close at 40*l.* *East Lovell* shares weak at 15*l.*-16*l.*. *East Carn Brea* shares have advanced to 8½*l.*-8¾*l.* A large amount of business has been done in *East Grenville* shares which have fluctuated considerably. Their closing price is 5⅜*l.* *East Caradon*, 28*l.* *Tincroft*, 17*l.*-17½*l.* *Wheal Trelawny*, 19½*l.* *Wheal Grenville*, 7⅛*l.*

BIRMINGHAM.—*Muntz Metal* shares have been quoted at 1*l.*-1⅛*l.* dis.

MANCHESTER.—*Stavely Coal and Iron*, 25*l.* prem. *Montes Aureos*, 2¼*l.*

LEEDS.—*Hebden Moor*, 8*s.* 6*d.*

DUBLIN.—The Irish mining share market has shown an upward tendency. *Wicklow Copper* shares have advanced from 13⅜*l.* to 14*l.* *Mining Company of Ireland* shares have been in request at 28*l.*-28½*l.* *Connorree* shares have been dealt in at 1*l.* *General Mining Company for Ireland*, 4¼*l.*

NEW YORK, *July* 19*th.*—The following have been the principal quotations in the mining share market: *American Coal*, $98-$110; *Bedford*, $1½-$1½; *Bucks County Lead*, $¾-$1; *Cumberland Coal*, $63; *Canada*, $3½-$4; *Central*, $59-$64; *Clute Lead*, $1½-$2; *Copake Iron*, $6⅛; *Central Coal*, $60-$65; *Evergreen Bluff*, $19-$20½; *Erie Lead*, $19; *Hancock*, $6¾; *Hamilton*, $4-$5½; *Indiana*, $10; *Isle Royal*, $21-$23; *Isaac's Harbour*, $1-$2; *Knowlton*, $8½; *Lafayette*, $2; *Manhattan*, $7½; *Mariposa*, $47-$60; *Mendota*, $5; *Minesota*, $41-$45; *New York and Nova Scotia Gold*, $1¾; *Ontonagon*, $5-$5½; *Pennsylvania Coal*, $216; *Providence*, $2½; *Quincy*, $102; *Reliance*, $1-$2½; *Rockland*, $12½; *Teal Lake Iron*, $8; *Wyoming Valley Coal*, $61. [*** Quotations in Legal Tender Notes: American Gold, 254°/₀.]

SAN FRANCISCO, *June* 18*th.*—The mining share market has assumed a more cheerful aspect during the latter part of the month, and it is hoped that business will now steadily improve.

In *Gould and Curry* shares, a large amount of business has been transacted at very fluctuating rates. Prices at one time receded to $2,400, but leave off at $3,120. The usual monthly dividend of $125 per foot has been declared. A number of transactions have also been reported in in *Ophir* shares, but at declining prices, shares having gone back to $600. *Real del Monte* shares have also receded to $37½-$42½. *Savage* shares have again declined, and were last quoted at $1,700. A good deal of business has been transacted in *Lady Bryan* shares at from $26 to $32. *North Potosi* shares have receded to $70-$80. *Chollar* shares have ranged from $500 to $630. *North American*, $140. *Burning Moscow*, $44. *Daney*, $70. *Yellow Jacket*, $950. *Uncle Sam*, $700. *Baltic*, $70. *Hale and Norcross*, $550. *Independent*, $130. *Sierra Nevada*, $35-$40. *Pride of the West*, $10. *Wide West*, $16. *Harmon*, $17. *Crockett*, $4. *Blue Ledge*, $8¼. *Imperial*, $130. [*** Quotations in Gold; Legal Tender Notes 52°/₀.]

METAL MARKETS.

LONDON, *August* 1*st.*—The business transacted in the metal market during the past month has been decidedly satisfactory, and although the tendency to activity has been somewhat checked by the advance in the rate of discount, there is every reason to anticipate a good autumn trade.

IRON.—The demand for Welsh bars has improved, and prices are about 5*s.* per ton dearer; 7*l.* f. o. b. Wales being the present quotation. Rails are steady, and the different works in full operation. The usual quarterly

meeting held at Birmingham on July 15th, will be long remembered by the fact that the decision of the iron masters' preliminary meeting at Stewponny to maintain current prices was, for the first time rendered nugatory by the fact of Mr. W. O. Foster and Messrs. Knight issuing circulars reducing the prices of iron 20s. per ton. This caused great commotion in the trade, but its ultimate effect has been a general reduction of 20*s.* per ton. The advisability of this course is generally considered to have been correct, but it has rendered the trade for the month uncertain and in many cases unsatisfactory. Scotch pig-iron has fluctuated but little; after touching 57*s.* 6*d.* the prices advanced to 59*s.* 6*d.*; from that it receded to 57*s.* 6*d.*, and after advancing again to 59*s.* 6*d.* and 60*s.* 6*d.* open, fell to 58*s.* 6*d.* cash and 59*s.* 9*d.* open. Swedish iron has been dull of sale.

COPPER.—This metal has advanced in price. At the commencement of the month the demand was slack, but it soon became more animated. The smelters, however, did not appear to be working in concert, for some issued private circulars announcing an advance of 3*l.*, while others demanded 5*l.* The latter has since become the official price, and a good business has been done. The standard of ores has advanced, and ores are scarce. In foreign, a fair business has been done; Burra has sold freely at 101*l.*, while Kapunda ingots have realized 106*l.*; Wallaroo 100*l.*; Chili has realized 90*l.* to arrive, 88*l.* on the spot.

TIN.—The amount of business transacted during the past month has been very large, though principally speculative. The smelters reduced the price of English 4*l.* per ton all round on the 4th. The statistical position of the article still remains very unsatisfactory, and the demand for consumption extremely small. At the commencement of the month prices were declining, and there appeared every probability of quotations soon reaching 100*l.* The low price, however, attracted attention, and some very large purchases of Straits were made on speculation. We estimate that fully 1,000 tons changed hands, the principal sellers being the regular importing houses; and as all this tin must have been sold at a heavy loss it proves their opinion of the prospects of the article. These operations in our market were not alone opportune for the holders of Straits' tin, but more particularly for the holders of Banca, who were just beginning to show great anxiety to ease themselves of their purchases made in the sale, and offered large lots here at f. 60¾, or a guilder under sales' prices. The most extraordinary feature in the trade has been the predilection shown for Straits, and operators have actually paid higher prices for it than they would for Banca, although it is an undisputed fact that the latter is intrinsically worth fully 2*l.* per ton over the former. How far the advance in Straits can be maintained, while the Dutch houses continue selling Banca, is a grave question, for the reports from Holland, in spite of the large deliveries during the past month, are anything but encouraging, which proves, that all over the continent the greatest caution is used in the purchase of tin. The deliveries during the past month from stock here have been satisfactory, but the landings have fully kept up with them. The principal export demand has been for France, which bought pretty freely when Straits was at 103*l.* per ton, but since the market has taken an upward course, the demand has stopped. The arrivals of tin in London during July, were 5,281 slabs; of which 2,431 slabs were Straits, and 2,850 slabs Banca from Holland.

TIN PLATES.—The market has been decidedly flat, and manufacturers complain of a great falling off in the demand from America, which is the great marke. Production has been curtailed by the continued drought.

LEAD has been very dull indeed, and declined in price about 15*s.* per ton. An arrival of about 250 tons of pig has just been reported from America, a most unusual occurrence.

SPELTER.—The market for this metal has been quiet during the month,

and lower prices have been submitted to. Just at the end of the month some large and curious transactions took place; purchases of about 600 tons were made at 24*l.* 10*s.* for July delivery, and the same quantity sold the next day at 23*l.* 10*s.* for delivery in September. The market has since improved to 24*l.*, and for delivery at out ports business has been been done at 24*l.* 5*s.*

GLASGOW, *August* 1*st.* IRON.—The Scotch pig-iron market opened firmer on the 29th, at 57*s.* cash; No. 1, G.M.B. 56*s.* 9*d.*; No. 3, 56*s.*, and continued so until the 2nd, when it became rather weaker, but rallied again on the 5th, and until the 8th a good business was done up to 59*s.* 9*d.* On the 8th the market became rather dull, and since then has fluctuated almost daily, closing rather firmer at 58*s.* 5*d.* cash. No. 1, G.M.B. 57*s.* 9*d.* No. 3, 57*s.*

PARIS, *August* 1*st.*—COPPER has been quoted at (per met. quin. English, 245 fr.; Lake Superior, 290 fr,; Chili, 233 fr.

TIN.—Banca, 290 fr.; English, 272½ fr. No business doing, quotations merely nominal.

LEAD.—Nothing doing in this article.

COLOGNE, *August* 1*st.*—The metal market here has been a little more active, and in some cases prices have advanced.

IRON.—Scotch pig has been quoted at (pr. ctr.) $1\frac{6}{10}$ thlr. to $1\frac{7}{10}$ thlr. Charcoal, spiegeleisen, 1⅝ thlr. to 1¾ thlr. Coke pig-iron 1⅛ thlr. to 1¼ thlr.

COPPER.—This metal has been quoted at somewhat higher rates. English 34 thlr.; American 39 thlr.; Paschkoff 40 thlr.; first quality rosette-copper 33 thlr.

TIN.—No business has been done in this metal. English has been quoted at 39 thlr.; Banca, 38 thlr.

SPELTER.—This article has been in better demand at higher prices, being last quoted at 7⅝ thlr. to 8 thlr.

ROTTERDAM, *August* 1*st.* TIN.—The stocks of Banca in the hands of the Trading Company on Warrants at the end of July, were 30,200 slabs, against 19,763 slabs at the corresponding date of last year. The quantity delivered from January to July of this year was 68,039, against 58,977 delivered during the corresponding period of 1863.

HAMBURG, *August* 1*st.*—A fair amount of business have been transacted in metals during the past month, and prices have been pretty firmly maintained.

IRON.—Scotch pig at (per ctr.) 2¾ mk.; English in bars 6½ mk.; Staffordshire descriptions, 7½ mk.; Swedish 8¾ mk.

COPPER,—The advance in the price of this metal in England has had a good effect here, and during the latter part of the month a considerable amount of business was transacted. English, 73 mk.; Demidoff, 75 mk.; Paschkoff, 86 mk.

TIN.—Some business has been transacted in this metal at firm prices. English, 11¾ sch.; Banca, 12 sch.

SPELTER.—The demand for this article has a little fallen off during the latter part of the month, and is last quoted at 16⅛ mk.

AMSTERDAM, *August* 1*st.* TIN.—A good business has been transacted in this article, 1,500 slabs of Banca changed hands at 61¾ fl.

BERLIN, *August* 1*st.*—The state of the metal market has much improved, and nearly all descriptions have advanced in price.

IRON.—Scotch pig and English sorts have been little dealt in, attention having been principally directed to Silesian products. Scotch pig at

(per ctr.) 51½ sgr. to 53 sgr.; Silesian charcoal pig-iron 52½ sgr. delivered here; coke made pig-iron 40½ sgr. to 41 sgr. at the furnace.

COPPER.—Little business has been done in this metal, although prices have been firmly maintained. English tough cake 32 thlr., best selected 33 thlr.; Paschkoff, 42 thlr.

TIN.—This article still continues exceedingly quiet. English, 36½ thlr.; Banca, 37½ thlr.

SPELTER.—W. H., 7¾ thlr.; ordinary brands, 7 thlr. 16 sgr.

HONGKONG, *May 30th.* LEAD.—Common, $6·10 to $6·30; best $6·30 to $6·40; 390 pigs sold.

IRON.—Nail rod, $2·95 to $3·20; sales, 3,500 piculs; hoop, $3 to $3·50; sales, 350 piculs; bar, $2·80 to $3; sales, 2,100 piculs.

AMOY, *May 23rd.* LEAD.—Pigs 530, at $7 per picul; stock 3,432 pigs.

SHANGHAI, *May 21st.*—The demand for metals has ceased.

Furnished by Von Dadelszen and North, 158, Leadenhall Street, London, E.C.

The business transacted in the metal market during the past month has been decidedly satisfactory, and although the tendency to activity has been somewhat checked by the advance in the rate of discount, there is every reason to anticipate a good autumn trade.

IRON.—The demand for Welsh bars has improved, and prices are about 5*s.* per ton dearer; 7*l.* f.o.b. Wales being the present quotation. Rails are steady, and the different works in full operation. In consequence of the reduction of 20*s.* per ton in the prices of Staffordshire iron, the trade has been uncertain, and in many cases unsatisfactory. Scotch pig-iron has fluctuated but little, after touching 57*s.* 6*d.* the prices advanced to 59*s.* 6*d.*; from that it receded to 57*s.* 6*d.*, and after advancing again to 59*s.* 6*d.* and 60*s.* 6*d.* open, fell to 58*s.* 6*d.* cash, and 59*s.* 9*d.* open, our closing quotations.

COPPER, as anticipated in our last, has advanced in price. At the commencement of the month the demand was slack, but it soon became more animated. The smelters advanced the prices 5*l.* per ton, at which a good business has been done. In foreign a fair business has been done. Burra has sold freely at 101*l.*, while Kapunda ingots have realized 106*l.* Walleroo 100*l.*, Chili 90*l.*, to arrive 88*l.* on the spot. The price of yellow metal has advanced ¼*d.* per lb.

TIN.—The amount of business transacted during the past month has been very large, though principally speculative. In English, the smelters reduced the price 4*l.* per ton on the 4th July, since which there has been a good demand. Straits declined early in the month to 103*l.*, at which there was a good demand for export. The market is now quiet at 105*l.* 10*s.* cash, and 107*l.* 10*s.* three months. Banca has been comparatively low in price, after declining to 104*l.*, it again advanced to 106*l.*, in Holland prices 62 f. to 52¼ f.

TIN PLATES.—The market has been decidedly flat, and production has been curtailed by the continual drought, and altogether the trade is unsatisfactory.

LEAD has been very dull indeed, and declined in price about 15*s.* per ton.

SPELTER.—The market has been quiet during the month, but latterly some large and curious transactions have taken place; purchases of about 600 tons were made at 24*l.* 10*s.*, for July, and the same quantity sold the next day at 23*l.* 10*s.* for September. The market has since improved to 24*l.*, and for delivery at out ports at 24*l.* 5*s.*

ANALYSIS OF BOARD OF TRADE RETURNS.

The "Accounts relating to Trade and Navigation of the United Kingdom, for the month ended 31st May, 1864, and five months ended 31st May, 1864, and for the month ended 30th June, 1864, and the six months ended 30th June, 1864," show, on analysis, the following results as to the Imports and Exports of Mining, Mineral, and Metallurgical products.

IMPORTS.—The quantities and relative increase and decrease of the imports of metals, metallic ores, and mineral products, for the month and five months ended 31st May, and for the month and six months ended 30th June, have been as follows :—

	Month ended 31st May.			Five Months ended 31st May.		
	1863.	1864.	Increase (+) or Decrease (−)	1863.	1864.	Increase (+) or Decrease (−).
Brimstone ... ... cwt.	15,744	104,606	+ 88,862	295,352	295,067	− 285
Copper Ore ... ... tons	9,611	5,570	− 4,041	33,084	26,681	− 6,403
Copper Regulus ... ... ,,	1,640	2,155	+ 515	9,743	10,052	+ 309
Copper, unwrought and part wrought ... cwt.	20,580	34,400	+ 13,820	83,140	149,640	+ 66,500
Iron, in Bars, unwrought, tons	2,994	2,403	− 591	6,575	9,584	+ 3,009
Steel, unwrought ... ,,	93	814	+ 721	561	2,556	+ 1,995
Lead, Pig and Sheet ... ,,	2,089	1,952	− 107	8,972	11,907	+ 2,935
Spelter or Zinc ... ... ,,	2,724	2,511	− 213	8,854	13,595	+ 4,741
Tin, in Blocks, Ingots, Bars, or Slabs ... cwt.	2,620	7,335	+ 4,715	14,227	23,126	+ 8,899
Silver Ore ... value in £	25,410	27,318	+ 1,908	139,223	124,038	− 15,185
Petroleum ... ...tuns	3,864	446	− 3,418	15,670	4,769	− 10,901
Pyrites ... ...tons	18,494	22,627	+ 4,133	60,439	51,344	− 9,095
Quicksilver ... ... lbs.	43,529	476,586	+433,057	401,627	1,671,999	+1,270,372

	Month ended 30th June.			Six Months ended 30th June.		
	1863.	1864.	Increase (+) or Decrease (−)	1863.	1864.	Increase (+) or Decrease (−)
Brimstone ... ...cwt.	50,633	106,459	+ 55,826	345,985	401,526	+ 55,541
Copper Ore ... ...tons	7,664	5,257	− 2,407	40,748	31,938	− 8,810
Copper Regulus ... ... ,,	1,936	3,362	+ 1,426	11,679	13,414	+ 1,735
Copper, unwrought and part wrought ... cwt.	18,800	45,380	+ 26,580	101,940	195,020	+ 93,080
Iron, in Bars, unwrought, tons	4,022	2,872	− 1,150	10,597	12,456	+ 1,859
Steel, unwrought ... ,,	207	410	+ 203	768	2,966	+ 2,198
Lead, Pig and Sheet ... ,,	2,111	2,565	+ 454	11,083	14,472	+ 3,389
Spelter or Zinc ... ... ,,	3,888	1,427	− 2,461	12,742	15,022	+ 2,280
Tin, in Blocks, Ingots, Bars, or Slabs ... cwt.	5,112	4,345	− 767	19,339	27,471	+ 8,132
Silver Ore ... value in £	35,108	3,665	− 31,443	174,331	127,703	− 46,628
Petroleum ... ...tuns	5,391	883	− 4,508	21,061	5,652	− 15,409
Pyrites ... ...tons	26,287	22,657	− 3,630	86,726	74,001	− 12,725
Quicksilver ... ... lbs.	—	370,928	+370,928	401,627	2,042,927	+1,641,300

EXPORTS.—The quantities, declared value, and relative increase and decrease of the exports of metals, minerals, and metallurgical articles of British and Irish produce and manufactures, for the month and five months ended 31st May, and for the month and six months ended 30th June, have been as follows :—

	QUANTITIES.				DECLARED VALUE.					
	Month ended 31st May.		Five Months ended 31st May.		Month ended 31st May.			Five Months ended 31st May.		
	1863.	1864.	1863.	1864.	1863.	1864.	Increase (+) or Decrease (−)	1863.	1864.	Increase (+) or Decrease (−)
					£	£	£	£	£	£
Alkali: Soda ... ...cwt.	173,358	208,777	886,288	925,274	74,268	89,198	+ 14,930	370,548	383,209	+ 12,661
Coal, Cinders, and Culm ...tons	694,975	711,144	3,168,269	3,385,193	305,760	330,896	+ 25,136	1,417,087	1,598,383	+ 181,296
Iron, Pig and Puddled ... ... ,,	48,827	54,030	188,745	188,413	131,118	164,443	+ 33,325	516,937	576,855	+ 59,918
Iron, Bar, Angle, Bolt, and Rod... ,,	27,759	26,713	131,672	127,964	211,197	250,121	+ 38,924	976,973	1,182,668	+ 205,695
Iron, Railroad, of all sorts ... ,,	37,093	38,074	161,348	179,893	276,435	321,277	+ 44,842	1,152,962	1,457,156	+ 304,194
Iron, Cast ... ... ,,	7,081	7,976	34,190	27,259	60,014	73,449	+ 13,435	290,119	261,164	− 28,955
Iron Hoops, Sheets, and Boiler Plates ... ... ,,	11,545	11,263	51,048	51,968	132,689	164,543	+ 31,854	573,964	741,197	+ 167,233
Iron, wrought, of all sorts ... ,,	10,187	10,435	43,208	42,989	197,420	219,493	+ 22,073	814,316	888,136	+ 73,820
Iron, old, for re-manufacture ... ,,	1,986	1,130	9,004	4,129	8,536	5,944	− 2,592	33,164	18,850	− 14,314
Iron Steel, unwrought ... ... ,,	2,493	2,812	11,016	13,746	85,939	94,110	+ 8,171	353,896	440,334	+ 86,438
Copper, unwrought, in Ingots, Cakes, or Slabs ... ... cwt.	29,924	9,567	106,947	38,598	135,771	48,957	− 86,814	488,093	201,364	− 286,729
Copper, wrought or partly wrought, Bars, Rods, Bottoms, Pans, Plates, Sheets, and Nails; and mixed or Yellow Metal for Sheathing .. ,,	51,168	36,280	216,683	166,436	228,421	186,200	− 42,221	986,975	866,350	− 120,625
Copper, wrought, of other sorts... ,,	849	1,624	3,874	4,309	4,800	9,706	+ 4,906	23,089	27,863	+ 4,774
Brass of all sorts ... ... ,,	4,644	3,827	16,932	14,723	23,733	20,321	− 3,412	84,552	82,259	− 2,293
Lead, Pig, Rolled, Sheet, Piping, Tubing, and Lead Shot tons	4,228	3,196	16,007	16,358	90,177	72,290	− 17,887	346,208	358,327	+ 12,119
Lead Ore, Lead, Red and White, and Litharge of Lead ... ,,	650	629	2,776	2,705	15,441	15,990	+ 549	65,722	68,200	+ 2,478
Tin, unwrought ... ...cwt.	5,662	8,449	28,633	36,639	33,387	45,137	+ 11,750	167,684	203,142	+ 35,458
Tin Plates ... ... ,,	86,159	121,500	460,780	506,347	102,628	154,190	+ 51,562	538,577	640,229	+ 101,652
Zinc or Spelter, wrought or unwrought ... ... ,,	8,585	13,414	35,910	52,327	8,174	14,002	+ 5,828	35,174	55,114	+ 19,940
Salt ... ...tons	70,796	58,829	262,416	244,410	33,613	26,626	− 6,987	118,795	113,476	− 5,319
				£	2,159,521	2,306,893	+ 147,372	9,354,835	10,164,276	+ 809,441

	QUANTITIES.				DECLARED VALUE.					
	Month ended 30th June.		Six Months ended 30th June.		Month ended 30th June.			Six Months ended 30th June.		
	1863.	1864.	1863.	1864.	1863.	1864.	Increase (+) or Decrease (−)	1863.	1864.	Increase (+) or Decrease (−)
					£	£	£	£	£	£
Alkali: Soda ... ...cwt.	154,498	178,421	1,040,786	1,103,695	63,391	76,705	+ 13,314	433,939	459,914	+ 25,975
Coal, Cinders, and Culm ...tons	712,572	751,367	3,880,841	4,136,560	308,796	341,261	+ 32,465	1,725,883	1,939,644	+ 213,761
Iron, Pig and Puddled ... ... ,,	41,323	49,308	230,068	237,721	110,731	151,807	+ 41,076	627,668	728,662	+ 100,994
Iron, Bar, Angle, Bolt, and Rod... ,,	25,711	25,626	157,383	153 590	192,418	243,352	+ 50,934	1,169,391	1,426,020	+ 256,629
Iron, Railroad, of all sorts ... ,,	38,327	43,004	199,675	222,897	267,194	336,782	+ 69,588	1,420,156	1,793,938	+ 373,782
Iron, Cast ... ... ,,	9,346	6,555	43,536	83,814	74,183	64,034	− 10,149	364,302	325,198	− 39,104
Iron Hoops, Sheets, and Boiler Plates ... ... ,,	11,074	11,815	62,122	63,783	130,234	163,264	+ 33,030	704,198	904,461	+ 200,263
Iron, wrought, of all sorts ... ,,	7,827	9,797	51,038	52,786	150,735	211,773	+ 61,038	965,051	1,099,909	+ 134,858
Iron, old for re-manufacture ... ,,	1,252	190	10,256	4,319	5,569	721	− 4,848	38.733	19.571	− 19,162
Iron, Steel, unwrought ... ... ,,	2,018	2,190	13,034	15,936	68,013	74,128	+ 6,115	421,909	514,462	+ 92,553
Copper, unwrought, in Ingots, Cakes, or Slabs... ... cwt.	31,274	11,834	138,221	50,432	142,386	57,221	− 85,165	630,479	258,585	− 371,894
Copper, wrought or partly wrought, Bars, Rods, Bottoms, Pans, Plates, Sheets, and Nails; and mixed or Yellow Metal for Sheathing ,,	46,214	57,168	262,897	223,604	211,370	276,817	+ 65,447	1,198,345	1,143,167	− 55,178
Copper, wrought, of other sorts... ,,	671	2,173	4,545	6,482	5,071	13,657	+ 8,586	28,160	41,520	+ 13,360
Brass of all sorts ... ... ,,	4,441	3,328	21,373	18,051	21,673	17,046	− 4,627	106,225	99,305	− 6,920
Lead, Pig, Rolled, Sheet, Piping, Tubing, and Lead Shot tons	3,017	1,742	19,024	18,100	64,746	39,506	− 25,240	410,954	397,833	− 13,121
Lead Ore, Lead, Red and White, and Litharge of Lead ... ,,	400	536	3,166	3,241	9,480	13,969	+ 4,489	75,202	82,169	+ 6,967
Tin, unwrought ... ...cwt.	7,985	8,023	36,518	44,662	47,354	43,032	− 4,322	215,038	246,174	+ 31,136
Tin Plates ... ... ,,	84,328	105,514	545,108	611,861	97,484	135,874	+ 38,390	636,061	776,103	+ 140,042
Zinc or Spelter, wrought or unwrought ... ... ,,	4,100	9,719	40,010	62,046	4,690	9,917	+ 5,227	39,864	65,031	+ 25,167
Salt ... ...tons	47,570	60,398	309,986	304,808	23,537	30,362	+ 6,825	142,332	143,838	+ 1,506
				£	1,999,055	2,301,228	+ 302,173	11,353,890	12,465,504	+ 1,111,614

LONDON PRICES CURRENT OF METALS.

From Messrs. JAMES and SHAKSPEARE'S, 10, Austin Friars, E.C., 1*st August*.

					Per Ton.				
IRON	Welch	Rails in Wales	£7	0	0	@	£7	5	0
		Bars „ „	6	15	0	„	7	5	0
		„	7	17	6	„	8	5	0
	Staffordshire	„	—			„	9	10	0
		Nail Rods	—			„	9	10	0
		Hoops	—			„	10	10	0
		Sheets	—			„	11	10	0
	Scotch	Pig (mixed Nos. warrants) in the Clyde	—			„	2	19	0
	Swedish Hammered	Iron — Large sizes	—			„	12	10	0
		Iron — Indian assortments	—			„	12	10	0
		Steel — Faggot	—			„	16	10	0
		Steel — In kegs (½ and ⅝ in.)	—			„	15	10	0
					Per Unit.				
COPPER		Ore	—			@	18*s.*	0*d.*	
		Regulus	—			„	18*s.*	0*d.*	
		Barilla	19*s.*			„	19*s.*	6*d.*	
					Per Ton.				
		Chili Slab (for 96% pure Copper)	—			none	—		
		Spanish Cake £	—			@	£90	0	0
	Australian	Burra and P.C.C.	101	0	0	„	102	0	0
		Kapunda	—			„	106	0	0
		Wallaroo	101	0	0	„	102	0	0
		Cadia	101	0	0	„	102	0	0
	American	Baltimore / Lake Superior	—			none	—		
	English	Tough Cake and Ingot and Tile	—			@	98	0	0
		Best selected Ingot	—			„	101	0	0
		Sheets, Sheathing and Rod	—			„	105	0	0
		Flat Bottoms	—			„	110	0	0
					Per lb.				
YELLOW METAL		Sheets (4 + 4 feet)	8½*d.*			@	8½*d.*		
		Sheathing and Rod	8½*d.*			„	9*d.*		
					Per Cwt.				
TIN	English	Common Blocks and Ingots	—			@	104*s.*		
		„ Bars (in barrels)	—			„	105*s.*		
		Refined	—			„	109*s.*		
	Foreign	Straits, Fine	—			„	106*s.*		
		„ (with 3 months' prompt)	—			„	108*s.*		
		Banca	—			„	106*s.*		
					Per Box.				
TIN PLATES		Charcoal IC, best	—			@	30*s.*	0*d.*	
		„ IX „	—			„	36*s.*	0*d.*	
		Coke IC	23*s.*	6*d.*		„	26*s.*	0*d.*	
		„ IX	29*s.*	6*d.*		„	32*s.*	0*d.*	
					Per Ton.				
LEAD	English	Sheet £	—			@	£21	15	0
		Pig—W.B.	—			„	22	10	0
	Foreign	„ Other good brands	20	15	0	„	21	0	0
		„ German and Spanish, soft	20	0	0	„	20	5	0
	English	Red	—			„	22	0	0
		Shot	—			„	23	15	0
		Dry White	—			„	26	10	0
SPELTER		(Silesian) in Cakes	—			„	24	0	0
ZINC		(Sheet) No. 9 and upwards	—			„	28	0	0
					Per Bottle.				
QUICKSILVER		(in bottles containing 75lbs. each)	8	0	0	@	8	5	0
					Per Ton.				
REGULUS OF ANTIMONY, French Star			36	0	0	@	36	10	0

Tabular Abstract of Mining Accounts for the Month.

Date of Account.	Name of Mine, and Number of Shares.	Balances. Debit. £ s. d.	Balances. Credit. £ s. d.	Calls. Per Share. £ s. d.	Calls. Total. £ s. d.	Dividends. Per Share. £ s. d.	Dividends. Total. £ s. d.
	CORNISH & DEVON MINES.						
June 16	Wheal Reeth (240)	358 18 8	—	—	—	—	—
,, 21	Fowey Consols (940)	—	1,319 13 10	—	—	—	—
,, 21	Treskerby (512)	15 0 0	—	1 0 0	512 0 0	—	—
,, 22	Camborne Vean (4,600)	369 10 8	—	0 2 6	575 0 0	—	—
,, 23	East Carn Brea (6,000)	—	13 12 1	—	—	—	—
,, 23	Hingston Down (6,000)	—	479 17 8	—	—	—	—
,, 23	Kelly Bray (5,000)	486 0 4	—	0 3 0	750 0 0	—	—
,, 23	Wheal Rose (2,000)	916 0 0	—	—	—	—	—
,, 23	Falmouth and Sperries (2,000)	1,694 0 0	—	0 16 0	1,600 0 0	—	—
,, 24	Wheal Union (6,000)	—	—	0 3 0	900 0 0	—	—
,, 24	Roborough Down (6,000)	—	—	1 0 0	6,000 0 0	—	—
,, 27	East Pool (128)	—	579 1 2	—	—	4 0 0	512 0 0
,, 27	South Hingston Down (?)	40 19 6	—	0 2 0	(?)	—	—
,, 28	Wheal Hope (2,048)	796 12 2	—	0 10 0	1,024 0 0	—	—
,, 28	Wheal Jane (512)	—	353 3 9	—	—	—	—
,, 29	Rosewarne Consols (4,026)	121 17 3	—	—	—	—	—
,, 29	North Basset (6,000)	139 1 11	—	0 2 0	600 0 0	—	—
,, 30	New Wheal Lovell (4,096)	39 0 9	—	0 2 6	512 0 0	—	—
,, 30	Penhallow Moor (512)	30 13 0	—	2 0 0	1,024 0 0	—	—
	Drakewalls (12,800)	—	1,317 15 10	—	—	—	—
July 1	North Devon (16,000)	—	330 3 11	—	—	—	—
,, 4	South Frances (496)	—	1,218 8 0	—	—	—	—
,, 5	New Birch Tor and Vitifer (6,000)	—	941 0 0	—	—	0 1 6	450 0 0
,, 5	Pendeen Consols (5,000)	202 13 2	—	—	—	—	—
,, 5	Prosper United (6,000)	—	314 9 11	—	—	—	—
,, 5	Par Consols (6,400)	—	3,857 8 8	—	—	—	—
,, 6	East Caradon (6,144)	—	7,866 7 3	—	—	1 0 0	6,144 0 0
,, 6	Marke Valley (9,000)	—	1,767 10 3	—	—	0 1 0	450 0 0
,, 6	West Rose Down (1,000)	—	123 11 2	0 15 0	750 0 0	—	—
,, 6	Carn Camborne (6,000)	—	9 1 11	0 2 0	600 0 0	—	—
,, 6	Tywarnhaile (6,000)	—	—	0 10 0	3,000 0 0	—	—
,, 6	Kitty (Lelant) (1,024)	—	388 8 4	—	—	0 7 6	384 0 0
,, 6	Trumpet Consols (1,000)	23 8 9	—	—	—	—	—
,, 8	Wheal Norris (6,000)	2,135 7 9	—	0 7 0	2,100 0 0	—	—
,, 8	Rosewall Hill and Ransom (6,000)	572 3 1	—	—	—	—	—
,, 12	Bedford United (4,000)	—	916 5 6	—	—	0 2 6	—
,, 12	Wheal Grylls (1,024)	1,471 19 4	—	1 10 0	1,536 0 0	—	—
,, 12	East Grylls (2,048)	1,230 0 0	—	0 12 6	1,280 0 0	—	—
,, 12	North Roskear (700)	2,209 17 1	—	2 0 0	1,400 0 0	—	—
,, 12	Grambler and St. Aubyn (486)	231 1 10	—	1 0 0	486 0 0	—	—
,, 12	Roskearnoweth (700)	20 7 3	—	—	—	—	—
,, 12	Great Grylls (3,072)	—	1,061 0 0	—	—	—	—
,, 13	Basset and Grylls (1,000)	93 9 4	—	—	—	—	—
,, 13	Stray Park (920)	596 16 9	—	0 10 0	460 0 0	—	—
,, 14	Hallenbeagle (6,000)	2,009 0 0	—	1 0 0	6,000 0 0	—	—
,, 14	Cook's Kitchen (2,450)	634 0 0	—	—	—	—	—
,, 15	St. Day United (4,000)	—	1,753 19 7	—	—	—	—
,, 15	Wheal Colenso (6,000)	—	—	0 1 0	300 0 0	—	—
,, 18	Emily Henrietta (1,024)	—	473 7 10	0 10 0	512 0 0	—	—
,, 18	West Damsel (256)	—	746 0 0	—	—	1 10 0	384 0 0
,, 19	Wheal Buller (256)	—	—	3 0 0	768 0 0	—	—
,, 19	Gurlyn (4,910)	1,095 0 0	—	0 4 6	—	—	—
,, 20	Bedford Consols (4,000)	76 17 6	—	0 1 0	200 0 0	—	—
,, 20	West Basset (6,000)	—	1,502 4 9	—	—	0 5 0	1,500 0 0
,, 22	Devon Great Consols (1,024)	—	33,794 1 4	—	—	10 0 0	10,240 0 0
,, 25	Copper Hill (1,024)	187 15 4	—	—	—	—	—
,, 25	Rosewarne United (3,848)	929 14 11	—	0 4 9	923 8 0	—	—
,, 26	South Caradon (512)	—	6,537 4 0	—	—	7 0 0	3,584 0 0
,, 26	East Basset (512)	—	1,605 10 1	—	—	2 0 0	1,024 0 0
,, 26	Gonamena (6,144)	—	544 5 2	—	—	—	—
,, 26	South Tolgus (512)	91 1 10	—	—	—	—	—
,, 26	Wheal Trannack (960)	—	41 10 6	0 2 0	96 0 0	—	—
,, 27	North Grylls (4,096)	153 6 7	—	0 5 0	1,024 0 0	—	—
,, 27	East Chiverton (2,000)	531 0 5	—	0 7 6	750 0 0	—	—
,, 27	Goonzion (2,000)	640 0 0	—	0 5 0	500 0 0	—	—

Tabular Abstract of Mining Accounts—(*continued from p.* 120).

Date of Account.	Name of Mine, and Number of Shares.	Balances. Debit. £ s. d.	Balances. Credit. £ s. d.	Calls. Per Share. £ s. d.	Calls. Total. £ s. d.	Dividends. Per Share. £ s. d.	Dividends. Total. £ s. d.
	WELSH & OTHER MINES.						
June 28	Merllyn (4,480)	184 4 1	—	0 1 0	224 0 0	—	—
„ 30	General Mining Association (25,000)	—	—	—	—	1 0 0	25,000 0 0
„ 30	Derwent Mine (280)	—	—	—	—	5 0 0	1,400 0 0
July 7	Mining Company of Ireland (20,000)	19,373 0 0	—	—	—	0 15 9	15,750 0 0
„ 13	Castell Carn Dochan (60,000)	—	676 10 1	—	—	—	—
	FOREIGN MINES.						
„ 1	Cape Copper (15,000)	—	—	—	—	0 10 0	7,500 0 0
„ 25	Port Phillip and Colonial (97,500)	—	—	—	—	0 1 0	4,875 0 0
„ 26	Cobre Copper (12,000)	—	—	—	—	0 8 0	4,800 0 0

Black Tin Sales.

Dates.	Mines.	Tons. c. q. lbs.	Price per ton. £ s. d.	Purchasers.	Amount of Money. £ s. d.
June 18.	Penhalls	6 8 2 9	—	—	417 7 8
„ 25.	North Jane	1 4 0 3	—	—	70 17 7
„ 29.	Cuddra	6 7 1 25	65 0 0	—	453 8 3
	„	0 14 1 25	54 0 0	—	
	Wheal Grenville	8 0 2 3	65 5 0	Mellanear	620 14 0
	„	1 15 1 2	55 0 0	ditto	
	Great Wheal Busy	17 0 0 0	—	—	949 9 2
	Phœnix	12 1 0 7	58 0 0	Enthoven & Son	699 1 8
„ 30.	Prosper United	7 2 2 23	62 10 0	Mellanear	547 0 9
	„	1 19 2 16	51 0 0	ditto	
	Wheal Kitty	24 5 3 8	—	Enthoven & Sons	1,554 12 7
July 7.	Par Consols	40 14 2 12	63 2 6	—	2,571 2 0
	West Fowey Consols	19 6 3 9	63 2 6	—	1,220 18 8
	St. Day United	48 16 0 19	—	—	2,582 6 8
„ 16.	Great Wheal Vor United	47 17 1 13	—	—	3,133 4 8
	Penhalls	6 7 1 26	—	—	406 7 0
„ 19.	Pedn-an-drea	8 9 1 17	—	—	489 4 5

Sundry Copper Ore Sales.

Dates.	Mines.	Tons.	Price per ton. £ s. d.	Purchasers.	Amount of Money. £ s. d.
June 27.	W. Canada Co. (John Bright)	96	16 18 6	Bibby, Sons & Co.	6,263 10 0
	„ „	86	17 4 6	ditto	
	„ (ex Guide)	96	16 19 6	St. Helen's Co.	
	„ „	90	16 19 6	ditto	
July 1.	Great Laxey	120	4 17 6	ditto	585 0 0
„ 19.	Parys	150	6 17 6	Mona Co.	2,857 10 0
	„	150	6 17 6	Sims, Willyams & Co.	
	„	150	2 13 0	Mona Co.	
	„	150	2 13 0	C. Lambert	

Blende Sales.

Dates.	Mines.	Tons.	Price per ton. £ s. d.	Purchasers.	Amount of Money. £ s. d.
July 1.	Minera	84	5 12 6	H. Southern	719 18 0
	„	30	5 7 0	ditto	
	„	16	5 8 0	Vivian & Sons	
„ 26.	Great Laxey	300	4 2 6	J. H. Attwood	1,237 10 0

Copper Ores.

Sampled June 15, and sold at Tabb's Hotel, Redruth, June 30.

Mines.	Tons.	Purchasers.	Price.
South Caradon	96	7	£5 8 6
	93	11	5 11 0
	86	1	7 19 6
	79	9	8 0 6
	60	3	15 13 0
	58	5	2 4 0
	57	1, 6	18 0 6
	31	3	6 16 0
Phœnix Mines	91	1, 5, 6	3 2 6
	81	2	3 11 0
	71	1, 5, 10	3 0 6
	67	13	6 16 6
	60	10	2 11 0
	58	8, 10	2 6 6
	54	4, 6	2 11 6
Tywarnhaile	73	4, 6	2 14 6
	68	9	2 12 6
	59	9	2 7 6
	58	7	3 2 0
	57	2	2 4 6
	52	6	7 13 6
	40	12	2 2 0
	38	6	8 8 6
West Damsel	74	2	5 5 0
	71	3	3 13 0
	70	2	3 3 0
	68	4, 6, 7	4 8 6
	53	2	4 15 0
	44	3	6 0 0
Great Wheal Busy.....	69	4, 5, 6, 7	2 2 6
	56	5	3 12 0
	50	12	4 10 6
	46	8	2 13 6
	43	5, 7	2 5 0
	42	7	3 11 6
	40	5	1 13 0
	8	6	4 19 6

Mines.	Tons.	Purchasers.	Price.
Clifford Amalgamated	82	5	£2 15 6
	72	5	4 19 6
	56	5	2 0 6
	50	5, 12	2 0 6
	46	3	5 7 6
	22	5, 6	5 12 6
	12	10	4 5 0
Fowey Consols	90	1	5 16 6
	81	1, 5	5 11 6
	79	6	7 16 0
Craddock Moor	58	5, 7	5 16 6
	56	7	9 15 6
	38	11	4 9 0
	22	10	2 10 6
	10	1	12 10 6
Glasgow Caradon	69	6, 12	4 1 6
	53	6	4 1 6
	48	6	2 15 6
Great North Downs ...	94	6	4 14 6
	55	6	4 15 6
Boscawen.....	44	7	2 19 6
	43	12	3 18 0
	28	3	9 13 0
East Wheal Ellen	50	12	3 16 6
Falmouth and Sperries	30	1, 5	2 12 6
Wheal Eliza Consols ...	28	1	8 7 6
East Polmear	27	6	7 19 6
Wheal Towan	25	1	1 13 0
North Grambler.....	20	13	4 6 6
Grambler and St. Aubyn	16	13	6 14 6
Visick's Precipitate ...	4	1	25 0 0
Moyle's ditto	4	5	26 10 0
Michell's ditto.....	2	1	30 0 0
Aver's ditto.....	2	1	30 0 0
Pengilley's ditto.....	1	5	30 5 0
Collin's ditto	1	5	33 10 0
Bolitho's ditto.....	1	5	35 10 0

TOTAL PRODUCE AND VALUE.

	Tons.	Amount.
South Caradon	560	£4,661 12 0
Phœnix Mines	482	1,670 17 6
Tywarnhaile	445	1,627 8 6
West Damsel	380	1,684 16 0
Great Wheal Busy	354	1,050 4 6
Clifford Amalgamated	340	1,222 8 0
Fowey Consols	250	1,592 0 6
Craddock Moor	184	1,235 3 0
Glasgow Caradon	170	630 7 0
Great North Downs	149	706 15 6
Boscawen	115	568 16 0
East Wheal Ellen	50	191 5 0
Falmouth and Sperries.....	30	78 15 0

	Tons.	Amount.
Eliza Consols	28	£234 10 0
East Polmear	27	215 6 6
Wheal Towan.....	25	41 5 0
North Grambler.....	20	86 10 0
Grambler & St. Aubyn.....	16	107 12 0
Visick's Precipitate	4	100 0 0
Moyle's ditto	4	106 0 0
Michell's ditto.....	2	60 0 0
Aver's ditto.....	2	60 0 0
Pengilley's ditto.....	1	30 5 0
Collin's ditto	1	33 10 0
Bolitho's ditto.....	1	35 10 0

EACH COMPANY'S PURCHASE.

	Tons.	Amount.
1 Vivian and Sons	385	£2,776 7 2
2 Freeman and Co.....	335	1,275 2 6
3 Grenfell and Sons	280	2,190 8 0
4 Crown Copper Co.*.....	—	—
5 Sims, Willyams & Co.	580½	2,041 16 1
6 Williams, Foster & Co.	794½	4,238 6 1
7 Mason and Elkington ...	386½	1,883 6 1
8 Bankart and Sons	75	190 9 6

	Tons.	Amount.
9 Copper Miners' Co.	206	£952 12 0
10 Charles Lambert	146¾	398 11 4
11 Newton, Keates & Co....	131	685 5 0
12 Sweetland, Tuttle & Co.	217½	747 5 9
13 Penclawdd Copper Co.	103	651 7 6
Total	3,640	£18,030 17 0

Average Produce, 6¼.
Quantity of Fine Copper, 229 tons 16 cwts.

Average Standard £123 11 0
Average Price per ton 4 19 0

* The purchases made by No. 4 (Crown Copper Co.) are included in the total of No. 6 (Williams, Foster & Co.), those firms being identical.

Copper Ores.

Sampled June 22, and sold at Tyack's Hotel, Camborne, July 7.

Mines.	Tons.	Purchasers.	Price.
Clifford Amalgamated	102	5	£3 17 0
	93	2	5 5 0
	92	5	3 17 0
	83	5	3 14 6
	77	6	4 17 6
	76	1, 13	10 13 6
	64	5	2 15 6
	63	5	4 14 6
	60	5	4 9 0
	52	1	11 6 0
(Consols)	50	5, 6	10 5 6
West Seton	90	7	5 9 6
	83	3	5 19 0
	67	3	5 1 6
	65	3	6 13 0
	54	3	6 17 6
	50	6	8 2 6
	41	9	2 15 6
Wheal Seton	32	2	5 4 0
	5	8	2 7 0
(Pendarves)	92	4, 6	6 7 0
	70	2, 10	4 9 6
	66	6	6 12 0
	60	9	4 19 0
	59	6	5 7 0
	20	9	1 13 0
South Tolgus	95	11	4 16 0
	62	6, 7	7 17 6
	61	10	4 11 0

Mines.	Tons.	Purchasers.	Price.
South Tolgus	47	11	£7 4 0
East Pool	66	6	4 1 6
	59	8, 13	4 11 6
	55	9	4 5 6
North Roskear	82	7, 13	10 4 0
	64	3	13 16 0
	28	13	7 0 6
Tolcarne	57	8	4 3 6
	41	7, 8	6 15 6
	37	12	4 13 6
	26	12	3 14 6
Wheal Basset	66	6, 9	5 10 6
	42	2, 6	5 9 0
	36	7	12 6 0
East Basset	46	13	6 8 6
	34	8	11 7 6
	19	1	13 14 6
South Frances	43	1	5 12 6
	29	2	5 11 6
	26	1	7 7 6
Nangiles	43	1, 2, 7	7 4 6
	19	3	6 12 0
	18	3	4 5 0
Carn Camborne	29	7, 9	3 15 0
	11	7	7 19 6
North Crofty	36	2	7 8 6
West Stray Park	32	7, 9	6 9 0
South Basset	17	7	4 12 6
Wheal Damsel	12	10	4 7 0

TOTAL PRODUCE AND VALUE.

	Tons.	Amount.
Clifford Amalgamated	812	£4,574 12 6
West Seton	450	2,667 13 0
Wheal Seton	404	2,156 17 0
South Tolgus	265	1,560 4 0
East Pool	180	774 0 0
North Roskear	174	1,916 6 0
Tolcarne	161	785 11 6
Wheal Basset	144	1,036 7 0

	Tons.	Amount.
East Basset	99	£943 1 6
South Frances	98	595 6 0
Nangiles	80	512 11 6
Carn Camborne	40	196 9 6
North Crofty	36	267 6 0
West Stray Park	32	206 8 0
South Basset	17	78 12 6
Wheal Damsel	12	52 4 0

EACH COMPANY'S PURCHASE.

	Tons.	Amount.
1 Vivian and Sons	192½	£1,791 4 2
2 Freeman and Co.	246	1,354 14 0
3 Grenfell and Sons	384½	2,826 0 8
4 Crown Copper Co.*	—	—
5 Sims, Williams & Co.	489	2,055 4 6
6 Williams, Foster & Co.	520	3,201 6 0
7 Mason and Elkington	295½	2,164 4 11
8 Bankart and Sons	146	910 6 6
9 Copper Miners' Co.	239½	£1,018 16 0
10 Charles Lambert	108	486 7 6
11 Newton, Keates & Co.	142	794 8 0
12 Sweetland, Tuttle & Co.	63	269 16 6
13 Penclawdd Copper Co.	182½	1,451 1 3
Total	3,004	£18,323 10 0

Average Produce, 7¼.
Quantity of Fine Copper, 215 tons 0 cwts.

Average Standard £123 13 0
Average Price per ton 6 2 0

* The purchases made by No. 4 (Crown Copper Co.) are included in the total of No. 6 (Williams, Foster & Co.), those firms being identical.

Copper Ores.

Sampled June 29, and sold at Tabb's Hotel, Redruth, July 14.

Mines.	Tons.	Purchasers.	Price.
West Basset	75	13	£7 7 6
	67	7	10 15 6
	66	4, 6	5 17 6
	53	13	4 18 6
	45	4, 6, 11	3 6 6
	40	9, 10	4 14 0
	22	3	13 0 6
Wheal Margery	76	8	2 12 6
	74	12	2 10 6
	70	4, 6	2 9 0
	66	4, 6	6 5 6
	64	8	6 17 6
East Carn Brea	76	2	4 16 0
	71	4, 6	8 6 6
	60	11	4 11 6
	52	2	4 16 6
	35	2	5 11 0
	22	9	2 14 6
Prosper United	76	7	5 1 0
	65	1, 7	3 8 6
	63	6	1 15 6
	49	7	6 12 6
	40	8, 13	4 17 0
Tolvadden	54	8	2 9 0
	40	1	3 19 0
	39	1	5 1 6
	29	1	4 10 6

Mines.	Tons.	Purchasers.	Price.
Tolvadden	5	4, 6	£15 15 6
East Rosewarne	47	7	9 13 6
	36	11	8 14 6
	32	3	13 16 6
	26	9	9 15 6
	21	12, 13	2 12 6
Par Consols	89	9, 10	6 14 0
	58	8	1 17 6
Treloweth	61	12	2 19 6
	40	5	5 1 6
	25	5	13 13 6
Copper Hill	43	3	9 17 6
	37	5, 7	3 0 0
	36	10	2 1 6
Wheal Buller	71	7	2 14 0
	12	11	7 17 6
	1	5	33 4 0
Wheal Trannack	36	1, 5	3 14 0
	4	1, 5	7 10 6
New Rosewarne	35	1	11 0 0
Wheal Emily Henrietta	20	3	6 2 0
North Basset	10	13	5 3 0
West Par Consols	4	6	25 10 6
	3	6	13 16 6
Crowan Consols	7	1	4 3 6
Cook's Kitchen	4	6	4 18 6

TOTAL PRODUCE AND VALUE.

	Tons.	Amount.
West Basset	368	£2,548 0 0
Wheal Margery	350	1,412 0 0
East Carn Brea	316	1,735 9 6
Prosper United	293	1,236 17 6
Tolvadden	167	698 6 6
East Rosewarne	162	1,520 10 0
Par Consols	147	705 1 0
Treloweth	126	726 7 0
Copper Hill	116	610 6 6

	Tons.	Amount.
Wheal Buller	84	£319 8 0
Wheal Trannack	40	163 6 0
New Rosewarne	35	385 0 0
Wheal Emily Henrietta	20	122 0 0
North Basset	10	51 10 0
West Par	7	143 11 6
Crowan Consols	7	29 4 6
Cook's Kitchen	4	19 14 0

EACH COMPANY'S PURCHASE.

	Tons.	Amount.
1 Vivian and Sons	202½	£1,094 6 9
2 Freeman and Co.	163	809 19 0
3 Grenfell and Sons	117	1,275 11 6
4 Crown Copper Co. *	—	—
5 Sims, Willyams & Co.	104½	715 4 6
6 Williams, Foster & Co.	382	2,018 4 0
7 Mason and Elkington	361	2,243 11 9
8 Bankart and Sons	272	977 11 0

	Tons.	Amount.
9 Copper Miners' Co.	112½	£706 5 0
10 Charles Lambert	100½	466 17 0
11 Newton, Keates & Co.	123	732 19 6
12 Sweetland, Tuttle & Co.	145½	395 17 9
13 Penclawdd Copper Co.	168½	990 4 3
Total	2,252	£12,426 12 0

Average Produce, 6¼.
Quantity of Fine Copper, 143 tons 16 cwts.

Average Standard £129 10 0
Average Price per ton 5 10 6

* The purchases made by No. 4 (Crown Copper Co.) are included in the total of No. 6 (Williams, Foster & Co.), those firms being identical.

Copper Ores.

Sampled July 6, and sold at the Royal Hotel, Truro, July 21.

Mines.	Tons.	Purchasers.	Price.
Devon Great Consols	146	13	£6 7 6
	138	8	4 1 6
	129	13	6 6 0
	126	4, 6	6 3 0
	125	4, 6	5 17 6
	124	13	6 13 0
	123	6	6 0 6
	122	1	5 17 6
	119	1, 13	6 7 6
	117	6	6 18 6
	115	2, 6	4 3 0
	110	10	2 12 0
	108	11	5 16 6
	104	3, 9	6 0 6
	98	9	5 3 6
	88	1, 8	1 5 6
	81	6	4 5 0
	65	1, 7	14 1 6
	50	3	16 14 0
	45	8	4 11 0
	41	1	2 7 6
	39	3	17 5 6
	16	7	3 11 6
	15	2, 12	3 12 6
	14	2	3 12 6
East Caradon	95	10	4 19 0
	82	12	2 7 6
	81	6, 10	4 6 6
	80	8	4 12 0
	74	1, 10	4 16 6
	60	8	6 6 0
	55	2	6 11 0
	25	2	13 0 0
New Wheal Martha	88	1, 5	2 3 6
	81	9	1 15 6
	73	10	1 4 6
	72	1, 5	2 1 0
	68	1, 5	2 2 6
New Wheal Martha	58	1, 5	£2 18 6
	49	10	1 6 6
Hingston Down	92	7	4 6 0
	91	7	3 18 0
	88	1	5 4 6
	86	4, 6, 9	4 5 6
	53	2	10 8 0
	41	2	9 15 0
Marke Valley	84	12	3 0 6
	81	3	3 8 6
	80	9	3 7 6
	70	3, 8, 9	3 16 6
	40	3	7 16 0
	31	12	2 14 6
	25	10	2 5 6
Bedford United	104	9, 11	4 15 6
	96	4, 6	4 7 6
Wheal Friendship	73	1	3 13 6
	60	1, 6	11 11 0
	44	5	7 7 0
East Russell	63	8	4 8 0
	58	8	4 6 6
	52	7	7 11 6
Wheal Emma	52	5	2 2 6
	50	1, 9, 12	3 0 6
	46	5, 12	5 2 6
Yarner Mine	118	1, 8	3 6 6
Crelake	56	1	2 2 0
	54	3, 6, 7	4 2 6
Bampfylde	101	1, 5	15 10 6
Gunnis Lake(Clitters)	60	4, 6	5 16 0
	38	4	5 16 0
Lady Bertha	56	9	2 17 6
Wheal Edward	41	8, 12	2 9 0
	14	6	6 10 6
Molland	50	8, 12	5 8 6
Fursdon	34	7	4 18 0
Collacombe	22	12	6 16 6

TOTAL PRODUCE AND VALUE.

	Tons.	Amount.
Devon Great Consols	2,258	£13,536 19 0
East Caradon	552	2,803 12 6
New Wheal Martha	489	951 5 6
Hingston Down	451	2,528 18 0
Marke Valley	411	1,522 12 6
Bedford United	200	916 12 0
Wheal Friendship	177	1,284 13 6
East Russell	173	921 19 0
Wheal Emma	148	497 10 0
Yarner	118	£392 7 0
Wheal Crelake	110	340 7 0
Bampfylde	101	1,568 0 6
Gunnis Lake (Clitters)	98	568 8 0
Lady Bertha	56	161 0 0
Wheal Edward	55	191 16 0
Molland	50	271 5 0
Fursdon	34	166 12 0
Collacombe	22	150 3 0

EACH COMPANY'S PURCHASE.

	Tons.	Amount.
1 Vivian and Sons	852½	£4,434 17 1
2 Freeman and Co.	253	1,952 15 3
3 Grenfell and Sons	303½	2,574 19 0
4 Crown Copper Co.*	—	—
5 Sims, Willyams & Co.	312½	1,662 7 3
6 Williams, Foster & Co.	983½	5,564 4 3
7 Mason and Elkington	335½	1,899 17 9
8 Bankart and Sons	615½	2,568 10 6
9 Copper Miners' Co.	487½	£1,905 14 10
10 Charles Lambert	429½	1,321 3 3
11 Newton, Keates & Co.	160	877 8 0
12 Sweetland, Tuttle & Co.	311½	1,064 16 1
13 Penclawdd Copper Co.	458½	2,947 7 3
Total	5,503	£28,774 0 6

Average Produce, 5¼.
Quantity of Fine Copper, 322 tons 18 cwts.

Average Standard £136 0 0
Average Price per ton 5 4 6

* The purchases made by No. 4 (Crown Copper Co.) are included in the total of No. 6 (Williams, Foster & Co.), those firms being identical.

Copper Ores.

Sampled July 13, and sold at the Royal Hotel, Truro, July 28.

Mines.	Tons.	Purchasers.	Price.
Wheal Rose	77	7	£5 0 0
	70	7	6 0 0
	67	7	5 10 6
	63	6	6 4 6
	60	10	5 5 6
	59	10	4 18 0
	55	9	5 8 6
	54	7	5 12 6
Phœnix Mines	75	8	1 15 6
	74	8	2 9 0
	71	8	2 17 0
	63	8	3 13 6
	50	10	1 7 6
	47	8	4 5 6
	43	8, 13	5 1 0
	35	2	5 16 0
South Caradon	88	2	6 3 6
	80	1	8 1 0
	63	1	15 15 6
	59	1, 6	16 4 6
	54	1, 6	15 18 6
	47	1	7 1 6
	37	6	5 19 6
	25	1, 10	6 8 6
Clifford Amalgamated	76	10	2 12 0
	75	3	5 12 0
	59	12	3 2 6
	44	5	5 17 6
	32	6	3 12 6
	31	10, 12	1 12 6
	30	6	4 5 6
	27	1	0 6 6
	10	1	3 8 6
West Caradon	67	10	5 6 0
	54	2	7 18 6
	52	5	7 4 0
West Caradon	49	9	£7 5 6
	45	9	5 19 6
	25	10	4 8 6
North Treskerby	51	3	4 8 0
	50	7	5 13 6
	47	3	5 0 6
	46	7	3 4 0
	42	7	3 14 0
	38	3	4 8 0
Great Wheal Busy	55	6, 10, 12	0 12 6
	51	10, 12	2 5 6
	43	10	3 3 0
	42	12	1 6 6
	37	10	4 0 0
	30	12	3 4 6
	2	5	39 17 0
Fowey Consols	66	1	5 16 6
	63	5	7 5 6
	46	1, 5	1 0 6
	36	1, 5	6 5 6
Boscawen	59	9, 10	3 6 0
	37	10	3 19 0
	33	6, 7	10 1 6
Wheal Polmear	55	6, 10	4 12 6
	48	6	4 19 6
North Downs	52	3	5 14 6
	50	3	5 17 0
New Treleigh	60	7, 10	3 8 0
	10	3, 6	9 10 6
Gonamena	36	13	5 13 6
	33	6, 9	4 16 6
South Crinnis	45	6	9 0 6
	15	10	4 9 6
Wheal Jane	5	5	3 8 0
Raby's Ore	4	5	9 12 0

TOTAL PRODUCE AND VALUE.

	Tons.	Amount.
Wheal Rose	505	£2,775 1 6
Phœnix Mines	458	1,438 2 6
South Caradon	453	47,12 13 6
Clifford Amalgamated	384	1,398 2 6
West Caradon	292	1,893 8 6
North Treskerby	274	1,214 2 6
Great Wheal Busy	260	1,115 16 6
Fowey Consols	211	1,115 16 6
Boscawen	129	£673 6 6
Wheal Polmear	103	493 3 6
North Downs	102	590 4 0
New Treleigh	70	299 5 0
Gonamena	69	363 10 6
South Crinnis	60	473 5 0
Wheal Jane	5	17 0 0
Raby's Ore	4	38 8 0

EACH COMPANY'S PURCHASE.

	Tons.	Amount.
1 Vivian and Sons	403	£3,523 5 6
2 Freeman and Co.	177	1,174 7 0
3 Grenfell and Sons	318	1,685 12 0
4 Crown Copper Co.*	—	—
5 Sims, Willyams & Co.	211	1,362 17 0
6 Williams, Foster & Co.	395½	2,843 3 2
7 Mason and Elkington	452½	2,333 10 3
8 Bankart and Sons	351½	1,057 16 0
9 Copper Miners' Co.	195	£1,100 13 9
10 Charles Lambert	627½	2,335 18 2
11 Newton, Keates & Co.	—	—
12 Sweetland, Tuttle & Co.	190½	431 8 8
13 Penclawdd Copper Co.	57½	312 17 6
Total	3,379	£18,161 9 0

Average Produce, 6⅔.
Quantity of Fine Copper, 215 tons 8 cwts.

Average Standard £127 9 0
Average Price per ton 5 7 6

* The purchases made by No. 4 (Crown Copper Co.) are included in the total of No. 6 (Williams Foster & Co.), those firms being identical.

Copper Ores.

Sampled June 8, and sold at Swansea, June 28.

Mines.	Tons.	Produce.	Purchasers.	Price.
Berehaven	100	10	3	£8 2 0
	90	10½	3	8 5 0
	121	10	7	8 4 0
	104	10	7	8 3 0
	80	10½	9	8 3 6
	78	9¼	3	8 0 0
	112	10	13	8 4 6
	62	10	13	8 4 6
	110	10	10	8 3 6
	100	10½	6	8 6 0
Knockmahon	90	11¼	6, 8	9 15 0
	55	11¼	8	9 15 0
	99	10½	7	8 6 6
	41	5⅝	5	4 4 6
	81	11¼	1, 2, 9	9 15 0
	28	11½	1	9 5 0
	93	11¼	6, 7	9 11 0
Cape Ore	103	22½	8	18 17 0
	87	22	1	18 10 0
	72	37	9	30 12 0
	71	36	6	30 10 0
Cape Copper	43	25¾	3	£21 11 6
	6	28½	3	24 9 0
	7	24½	3	20 14 6
Gwalla Ore	8	32⅜	2	27 15 0
	12	40½	7	34 5 0
	70	22½	2, 7	18 12 6
	4	43¾	7	36 17 0
	58	20¼	8	17 5 6
	8	22	7	18 10 0
Holyford	14	16⅜	5	13 16 0
Connorree Ore	24	4⅜	7	3 3 0
	62	3	10	2 0 0
	4	38	3	30 0 0
	3	37½	10	29 2 6
	64	3½	7	2 2 6
	4	22	3	17 10 0
Wallaroo	68	9⅜	13	7 15 6
	64	9⅜	2	7 13 6
Spanish Copper	5	33½	2	28 6 0
	1	33	2, 8	28 2 0
Burnt Ore	64	3½	8	2 9 0

TOTAL PRODUCE AND VALUE.

	Tons.	Amount.
Berehaven	957	£7,830 14 0
Knockmahon	487	4,348 1 0
Cape Ore	389	9,139 5 0
Gwalla	160	3,234 2 0
Holyford	14	193 4 0
Connorree Ore	161	£ 612 19 6
Wallaroo	132	1,019 18 0
Spanish Copper Ore	6	169 12 0
Burnt Ore	64	156 16 0

EACH COMPANY'S PURCHASE.

	Tons.	Amount.
1 Copper Miners' Co.	142	£2,131 15 0
2 Freeman and Co.	140	1,797 18 6
3 Grenfell and Sons	332	3,586 0 0
4 Crown Copper Co.	—	—
5 Sims, Willyams, & Co.	55	366 8 6
6 Vivian and Sons	262½	3,878 6 6
7 Williams, Foster & Co.	581½	4,834 14 6
8 British and For. Copper Co.	209½	3,747 14 6
9 Mason and Elkington	179	3,120 9 0
10 Bankart and Sons	175	£1,110 12 6
11 Charles Lambert	—	—
12 Ravenhead Copper Co.	51½	970 15 6
13 Sweetland, Tuttle & Co.	242	1,959 17 0
14 Jennings & Co.	—	—
15 Penclawdd Copper Co.	—	—
16 Mona Copper Co.	—	—
Total	2,370	£26,704 11 6

No Sale on July 12th.

Sampled July 6, and sold at Swansea, July 26.

Mines.	Tons.	Produce.	Purchasers.	Price.
Cuba	120	14⅞	7	£13 2 6
	114	14½	3	13 2 0
	100	15⅜	3	12 17 0
	92	15½	2, 7	12 18 6
(Slime)	89	22⅞	9	20 11 6
(Precipitate)	16	73⅜	5	61 14 6
	15	73½	5	62 17 0
	14	73½	5	62 5 0
	11	73½	8	62 5 0
	6	72½	3	62 0 0
Knockmahon	67	13⅜	13	12 4 0
	68	6⅞	5	4 19 6
	129	13⅛	16	12 6 0
Copper Slag	60	3⅛	10	£2 5 0
	52	4½	10	3 0 0
(Sludge)	6	22⅞	10	19 10 0
Holyford	4	17½	5	15 2 6
Berehaven	122	10½	1, 7, 9	9 3 0
	86	10⅜	16	9 6 0
Cape Copper Co.	12	26½	9	24 0 0
	7	32⅛	10	29 10 6
	8	21⅞	9	19 17 0
	19	26½	9	24 2 0
Irish ore	21	10	16	8 18 6
Copper slag	4	9½	6	7 0 0

TOTAL PRODUCE AND VALUE.

	Tons.	Amount.
Cuba	577	£11,232 5 6
Knockmahon	264	2,742 8 0
Copper Slag	118	408 0 0
Holyford	4	60 10 0
Berehaven	298	£1,916 2 0
Cape Copper Company	46	1,111 7 6
Irish Ore	21	187 8 6
Copper Slag	4	28 0 0

EACH COMPANY'S PURCHASE.

	Tons.	Amount.
1 Copper Miners' Co.	40⅜	£372 2 0
2 Freeman and Co.	46	549 11 0
3 Grenfell and Sons	220	3,150 8 0
4 Crown Copper Co.	—	—
5 Sims, Willyams & Co.	117	3,200 13 0
6 Vivian and Sons	4	28 0 0
7 Williams, Foster & Co.	206¾	2,541 13 0
8 British and For. Copper Co.	11	684 15 0
9 Mason and Elkington	168½	3,108 19 6
10 Bankart and Sons	125	£614 13 6
11 Charles Lambert	—	—
12 Ravenhead Copper Co.	—	—
13 Sweetland, Tuttle & Co.	67	817 8 0
14 Jennings & Co.	—	—
15 Penclawdd Copper Co.	—	—
16 Mona Copper Co.	236	2,573 18 6
Total	1,242	£17,686 1 6

Lead Ore Sales.

Dates.	Mines.	Tons.	Price per Ton. £ s. d.	Purchasers.	Amount of Money. £ s. d.
June 25.	Trelawny	61	29 7 6	Treffry's Trustees	2,350 13 6
,,	,,	44	12 14 0	Phillips & Darlington	
,, 27.	Isle of Man Mining Co	100	16 3 6	J. & J Williams	2,176 6 0
	,, (silver chats)	30	16 6 0	R. Michell & Son	
	East Logylas	70	14 7 0	Panther Co.	1,004 10 0
	Glogfach	17	19 1 0	Sims, Willyams & Co.	323 17 0
	Cwmystwith	50	14 7 6	Newton, Keates & Co.	1,443 15 0
	,,	50	14 10 0	ditto	
,, 29.	Minera Union	20	14 0 0	ditto	280 0 0
,, 30.	North Devon	30	13 4 6	Falmouth Co.	396 15 0
July 1.	Minera	100	14 17 0	Sims, Willyams & Co.	
	,,	100	15 1 0	ditto	
	,,	100	14 14 0	ditto	
	,,	69	14 14 0	ditto	
	,,	104	15 1 0	ditto	9,187 19 10
	,,	104	14 11 0	ditto	
	,,	21½	14 15 6	Walker, Parker & Co.	
	,,	21½	14 15 6	Panther Co.	
	Cargoll	63	18 5 6	R. Michell & Son	1,151 6 6
,, 2.	Bronfloyd	25	14 18 6	Sims, Willyams & Co.	373 2 6
,, 5.	Maesysafn	70	14 17 6	Panther Co.	2,075 10 0
	,,	70	14 15 6	ditto	
	Wheal Mary Ann	31	28 15 6	Sims, Willyams & Co.	1,429 15 6
	,,	30	17 18 6	Falmouth Co.	
,, 6	Great Laxey	100	26 2 0	Sims, Willyams & Co.	2,610 0 0
,, 8.	Havan	50	13 11 6	Newton, Keates & Co.	678 15 0
	Isle of Man Mining Co.	100	24 10 6	Treffry's Trustees	2,452 10 0
,, 11.	Frongoch	134	13 18 0	Walker, Parker & Co.	1,862 12 0
	East Darren	75	17 7 6	A. Eyton	1,303 2 6
	Cwm Erfin	31	17 15 6	Treffry's Trustees	1,106 14 0
	,,	31	17 18 6	Panther Co.	
,, 14.	Talargoch (Maesyrerwddu)	34½	15 4 0	Walker, Parker & Co.	1,131 9 9
	,, (Coetia Llys)	71½	15 16 6	ditto	
	Deep Level	20	14 4 0	ditto	284 0 0
	Brynford Hall	5	14 0 0	A. Eyton	70 0 0
	Rhosesmor	56	14 14 6	Walker, Parker & Co.	824 12 0
	Parry's	21	14 7 6	ditto	301 17 6
	Bryn Gwiog	45	14 18 6	ditto	671 12 6
	Long Rake	30	14 3 6	A. Eyton	425 5 0
	Billins	10	14 8 6	Walker, Parker & Co.	144 5 0
	North Henblas	20	13 16 6	ditto	276 10 0
	Pennant	15	14 5 0	A. Eyton	213 15 0
	Trelogan	4½	14 0 0	ditto	63 0 0
	Penyrorsedd	20	14 4 0	Newton, Keates & Co.	284 0 0
	Dog Pit	14	13 5 0	ditto	185 10 0
	Merllyn	4	14 5 6	Brymbo Co.	57 2 0
	Pool Park	18	15 2 6	ditto	272 5 0
	Dyliffe	55	14 12 6	ditto	
	,,	48	14 12 6	A. Eyton	2,088 7 6
	,,	40	14 11 0	ditto	
	Roman Gravels	6½	14 2 6	ditto	
	,,	6½	14 2 6	Newton, Keates & Co.	275 8 9
	,,	6½	14 2 6	Walker, Parker & Co.	
	Llangynog United	12½	13 8 6	ditto	167 16 3
	Bryntail	12¼	13 10 6	Newton, Keates & Co.	196 13 7½
	Dyfngwm	11	13 13 0	ditto	150 3 0
	Llanerchyrmur	16	14 9 6	A. Eyton	231 12 0
	Caeconroy	5½	15 10 0	Walker, Parker & Co.	81 7 6
	Pant-y-Pydew	6	14 5 0	Newton, Keates & Co.	85 10 0
,, 22.	Minera Boun, and Lower Elsteddfod	30	14 2 6	Brymbo Co.	423 15 0
	Twelve Apostles	40	14 5 0	J. Hughes	570 0 0
,, 26.	Bwich-y-Plwm	31½	13 14 0	Walker, Parker, & Co.	431 11 0
	Maesysafn	70	14 16 0	Mining Co. of Ireland	2,054 10 0
	,,	70	14 11 0	ditto	
,, 28.	Hendre Ucha	10	14 8 6	A. Eyton	144 5 0
	Bryngwyn	13	14 14 6	ditto	
	Pant-y-Mwyn	6	13 10 0	Walker, Parker, & Co.	272 8 6
	,,	6	13 10 0	Brymbo Co	
	Llanerchyrmur	8	14 9 6	Walker, Parker, & Co.	231 12 0
	,,	8	14 9 6	Brymbo Co	

THE

MINING AND SMELTING MAGAZINE.

SEPTEMBER, 1864.

The Metallurgical Processes of the Mansfeld Copper Works.

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(*Continued from page* 73.)

III. Details of the Smelting Operations.

§ 1. *Treatment of the Ordinary Ores or "Work."*

a. Raw Smelting Operations:

The raw smelting operations are carried on at seven distinct works, whose site has been selected with regard to the combined advantages of their vicinity to the mines, the presence of adequate water-power, and sufficient space for the slag-tips. The schist from the upper concessions is treated at four of these works—two of which (the Eckardthütte and the Kreuzhütte) are situated near Leimbach, not far from Mansfeld, and the other two (the Oberhütte and the Mittelhütte) near Eisleben. The schist from the lower concessions is treated at two works—the Kupferkammerhütte near Hettstädt, and the Friedeburgerhütte near Friedeburg. At the seventh works, the Sangerhäuserhütte near Sangerhausen, the schist from the Sangerhäuser concessions used formerly only to be treated, but lately the schist from the Glückaufer, one of the upper concessions, has also been treated there.

1. *Preliminary Operations:*

Hand-picking.—After raising, the schist is first subjected to a careful hand-picking at the mines.

* Abstracted from the *Berg- und Hütten. Zeit.*, Nos. 8, 11, 17, 23, 27, 32, &c., 1864.

Dressing.—The fine dissemination of the ore in the schist prevents the possibility of its being dressed. Nor indeed is this necessary, as, besides its small metallic produce, the earths happen to occur in the schist in the proportions required for the formation of a slag. The *dach* and the rich sand-ores can also be advantageously smelted mixed with the schist, without being previously dressed. But this is not the case with the poor sand-ores, on account of the high percentage of silica they contain; so that the ores of this class smelted have to be previously dressed up to the required richness. This is done at the Sangerhäuserhütte, where there are two stamps of six heads each, together with the necessary dressing appliances of strakes, shaking-frames, a drying shed, &c.

The ores are stamped in a current of water, the strakes which receive the stamped work having 20 falls. In the first 14 falls, a fine sand is deposited; in the following falls a fine clay, in which minute particles of ore are thinly disseminated, which is called sticky (viscous) slime, and which contains $1\frac{1}{2}\%$ of Cu. The sand which is deposited in the first 14 falls is treated several times on the shaking-frames, the result of which is a rich work containing from 8% to 10% of Cu, and tailings with from $0{\cdot}4\%$ to $0{\cdot}7\%$ of Cu. This rich frame-work is mixed with the viscous slimes until the whole averages about 6% of Cu, and is then kneaded into lumps that are called *Wäschgut*, which are dried and then smelted. Attempts have been made, with the application of new apparatus, to carry the dressing further, but hitherto without satisfactory results.

Carriage of the Schist.—The schist is conveyed in waggons called "*Schieferhöhlen*" to the works, where it is reckoned in *fudern* of 60 centners each. It is weighed in machines capable of weighing from 176 to 200 centners; and 4 lbs. water-weight are allowed to each centner. No fraction of a centner is taken into account, any quantity under half a centner being ignored, and any quantity over half a centner being reckoned as a full centner. The ores being poor, this system is found to answer sufficiently well. In the case of fluor-spar, from 4 to 6 lbs. is allowed for water-weight and waste. In the case of coke supplied from the depôt an allowance of from 1 to 2% is made for loss in transport; but in the case of the fuel weighed at the works (such as Westphalian and Wettiner coke, Riestädt lignite, &c.) this is of course unnecessary.

2. *Roasting the Schist:*

Object.—The essential condition for the subsequently advantageous smelting of the schist is that its bituminous constituents, carbonic acid, and water, shall be completely got rid of in the roasting. Upon this being effectually done likewise depends the proper disintegration of the schist, which is also so essential an element in the successful smelting although, when any schist becomes reduced so fine as to be in a state of powder, it has on the contrary to be coagulated during the roasting to render it fit for treatment in blast-furnaces.

Choice of Method.—The objects to be attained by the roasting may be effected by simply igniting the schist, for its bituminous

contents are sufficient to enable it to roast itself. The following injurious influences have, however, to be avoided:—

1. The temperature must not be allowed to get so high as to fuse the schist, for two reasons—1stly, because the advantages gained by its disintegration would be thus lost; and, 2ndly, because it is desirable to avoid any considerable loss of sulphur.

2. For the latter reason the oxidising influence must not be too strong. It is doubtful by what mode the schist can undergo these necessary preparatory operations with the least expenditure of fuel, and at the same time be as much as possible protected from the injurious influences mentioned. The most simple method, that of roasting in open heaps, is the most economical. The schist is ignited by being piled on a bed of wood, and the heat is maintained by its bituminous constituents: in order that the temperature may not rise too high the heaps are made rather low, not exceeding 7′. The bituminous constituents, and a judicious making up of the piles, prevent any oxidising effect.

It has been questioned whether it would not be judicious to roast the schist in blast-furnaces. It was supposed that in roasting in furnaces the heat from the combustion of the bitumen could be utilised, which would thus cover the cost of erection. This notion, however, has never been practically carried out, but experiments have lately been tried to make the bituminous constituents of the schist available by roasting in closed furnaces. In roasting in blast-furnaces, by which the bed of wood was dispensed with, the schist unfortunately fused.

Roasting in Open Heaps.—Up to the present time, the schist has been roasted exclusively in open heaps. At each of the raw smelting works there is a large, flat, open space where the roasting is effected—which space is on a level with the throats of the blast-furnaces at the Mansfelderhütte, Mittelhütte, and the Sangerhäuserhütte. At the Kupferkammerhütte and at the Oberhütte this space is higher, as local circumstances do not allow of its being otherwise.

Piling the Heaps.—The schist must be heaped up more or less carefully according to its compactness. With the compact schist of the upper concessions (Mansfelderhütte and Eislebenerhütte), the carts are emptied directly on the heaps, which also burn through irregularly without any injurious result. With the soft schist of the upper and Sangerhäuser concessions (Kupferkammerhütte, Friedeburgerhütte, Sangerhäuserhütte) the schist is brought to the heaps by handbarrows, and arranged as a truncated pyramidal pile, the interstices of which are filled up with schist-dust as equally distributed as possible. The schist containing the smallest proportion of bituminous matters is placed in the lower part of the heap, so that they may be completely burnt out (Sangerhäuserhütte). With the exception of the height, which must not exceed 7′, the dimensions of the heaps are not essential. When the schist is in great demand, the heaps are made smaller, so that they may be more quickly roasted, and when once ignited they are left to themselves.

Working Results.—The duration of the roasting varies with the bituminous contents of the schist, and probably also with other conditions. At the Mansfelderhütte works a schist-heap containing from 500 to 3,000 *fudern* is ignited immediately after the piling up has commenced, but after the heaping is completed it burns from 10 to 30 weeks. At the other works, heaps containing from 200 to 500 *fudern* burn from 13 to 26 weeks, except at the Sangerhäuserhütte, where, as the schist contains but little bitumen, a heap containing from 200 to 250 *fudern* only burns from 7 to 8 weeks.

The consumption of faggot-wood in roasting is as follows:—

At the Eislebenerhütte	... 0·15	*schock* (threescore)	per	*fuder.*
„ Mansfelderhütte	... 0·1	„	„	„
„ Friedeburgerhütte	... 0·05 to 0.1	„	„	„
„ Kupferkammerhütte	0·15	„	„	„
„ Sangerhäuserhütte	... 0·1 to 0·2	„	„	„

The large consumption of fuel at the Sangerhäuserhütte is caused by the small quantity of bitumen contained in the schist of that concession. The weight lost by the schist during roasting is from 6·6% to 16·6%.

After the heap is burnt out the schist must be removed and smelted as quickly as possible; for long exposure to the air causes it to absorb CO^2, and to decrepitate, as it contains a good deal of caustic lime (as well as CaS). Well roasted schist has a bright colour and rings when struck.

The Chemistry of the Process.—The chemistry of the process of roasting the schist is not so simple as is generally supposed. If the schist-heap is examined after it has burnt out it will be found that the underneath is studded with very fine crystals of sulphur, which can be clearly recognised with the aid of a glass as rhombic-octahedrons. This sulphur must therefore have been sublimed, and must have had its origin from the metallic sulphides which are finely disseminated throughout the schist. A small portion may have been sublimed from the iron pyrites; but the larger portion must have originated in the following manner.

The oxidising influence first changed the metallic sulphides into sulphates which, with the increasing temperature, gave off SO^3 or SO^2. As the vapours of the SO^3 passed up through the heap, the carbon of the bitumen reduced it to SO^2 ($SO^3+C=SO^2+CO$). But with an increased temperature, the SO^2 was also reduced by the carbon, forming vapours of sulphur and carbonic oxide ($SO^2+2C=S+2CO$). This view is corroborated by the fact that the odour of SO^2 is never perceptible near the burning schist-heaps. Under the thin uppermost layer of schist (which remains unaffected) there is observed a thin layer of green or blue coloured schist, and under that again, one of red coloured schist. The green and blue colours are no doubt caused by the sulphates, and the red by oxides. The temperature at the surface, just under the unburnt upper schist, did not rise sufficiently high to decompose the sulphates, which was effected somewhat deeper down. Under these three upper distinctive layers we find the mass of homogeneous well-roasted schist; but

between them various formations of small crystals are visible, the accurate study of which might lead to interesting results.

3. *The Raw Smelting:*

Object.—The object of the raw smelting is to concentrate the metallic portion of the "work" into a regulus, and to slag off the earths.

Choice of Method.—Of the two ordinary methods of obtaining copper-regulus, in blast-furnaces and in reverberatory furnaces, the former has been in use at Mansfeld from the earliest period, having been preferred in consequence of the abundance in the neighbourhood of good sandstone for the hearth, and of a sufficient supply of water-power. Between 1846 and 1850 experiments were made for smelting the schist in reverberatory furnaces, and although they were without any practical results they brought to light many interesting circumstances, a few of which are worth referring to here.

To carry out these experiments the reserve concentration-furnace at the Gottesbelohnungshütte was altered so as to make the bed higher at the fire-bridge than at the flue. The raw schist (unroasted) was charged (by a hopper) on to the higher part of the bed, where it underwent the necessary operations of smelting with the heat derived from its bituminous constituents. The melted schist flowed down the inclined bed of the furnace, and near the flue the slag was skimmed off, and the regulus tapped. On the raw schist being charged into a furnace heated to a dark red heat, it was found to burn with a smoking flame, without at all evolving the amount of heat that had been expected; and the carbon separated in the form of fine scales of graphite, rendering the schist almost unsmeltable. The experiment was repeated with roasted schist which smelted very well—the slag and regulus, which collected in the lower portions of the bed, being easily removed, while fresh schist was being charged without interruption. In this latter experiment unfavourable conditions soon became apparent. After the charging, some time elapsed before the temperature became sufficiently high to smelt the schist. During this interval it was exposed to the oxidising influence of the gases from the fire, particularly of the CO^2, which gave rise to a considerable loss of sulphur, as was conclusively shown by the odour of SO^2 perceived during the charging. It was not therefore surprising that the result was red slag. These evils might probably have been obviated by previously heating the schist (possibly by the waste gases) in order to bring about a quicker smelting; by employing other kinds of fuel instead of the Riestädt lignite; or by a differently constructed furnace. But the extremely unfavourable result in the yield of copper gave no encouragement for further experiments in this direction. Thus 259 centners of roasted schist, mixed with 9 centners of fluor-spar and 14 centners of black-copper slags (from the black copper smelting), only yielded 157 lbs. of copper regulus, containing 81 lbs. of fine copper and 13¼ *loth* (about 6½ oz.) of silver, leaving a very rich bed. Without taking into consideration the percentage of copper in the black-copper slags, the above result would give, per *fuder* of schist, a yield of 36 lbs. of copper regulus, or 18·7 lbs. of copper, and 3·07 *loth* (1·535 oz.) of silver, besides the unascertained quantity that remains in the bed. In working with the blast-furnace, the average yield obtained from the same quantity

of schist is 5 centners of copper regulus, or 150 lbs. of copper, and 24 *loth* (12 oz.) of silver, besides about 3 centners of *Schweel.* Thus the loss amounted to 131·3 lbs. of copper and 20·93 *loth* (10·465 oz.) of silver per *fuder* of schist. Supposing this loss to be partially compensated by making available the rich bed of the furnace, still the working expenses would be considerably increased. These results completely do away with any advantages derived from working with reverberatory furnaces; so that the blast-furnace still continues to be exclusively used.

Choice of Furnaces.—The schist is smelted in furnaces from 13½′ to 20′ high, of the kind called *Brillenofen.* The small percentage of iron contained in the charge, and the consequently inconsiderable size of the bears formed, allows of the use of high furnaces, which are always preferable to lower ones in respect of the smaller consumption of fuel. It is well known that the ores of the Upper and Lower Harz require lower furnaces, in consequence of the higher percentage of iron they contain. The formation of a small bear cannot be avoided, so that the use of the *Tiegelofen* is excluded; but still the *Sumpfofen* is not necessary.* This is also the case in the Upper Harz; but the ores of the Lower Harz, in consequence of their high percentage of iron, require a *Sumpfofen.*

Form of Furnace.—With reference to the height, form, and dimensions of the furnaces, these are found to vary at the different works, consequent on the variations in the nature of the schist to be smelted. The schist of the upper concessions, which is difficult to smelt, and which contains a high percentage of arsenic and but little zinc, is obviously distinct from the schist of the lower concessions, which is easily smelted, but contains a high percentage of zinc and little arsenic. The former, from being difficult to smelt, requires higher furnaces, which also act favourably with regard to separating the arsenic, and which are available for use in consequence of the small percentage of zinc. The latter, being very rich in zinc, must, on the contrary, be smelted in lower furnaces, as such furnaces are favourable to the formation of large quantities of furnace-calamine (for instance, the older furnaces of the Lautenthaler works in the Upper Harz); and the fusibility of the ores, with the small quantity of arsenic they contain, allowing of such furnaces being adopted without injurious results. Thus the furnaces at the Mansfeld and Eisleben raw-smelting works are from 16′ to 20′ high, while those at the Kupferkammer and the Friedeburger works, are only from 13½′ to 14½′ high. The various dimensions of width and length, with furnaces of various heights, are very difficult to explain theoretically: they are founded on experience and custom.

The furnaces formerly employed, called small furnaces (*Kleinöfen*), which had a trapezoidal section that varied little at the various heights, have been lately partially replaced by large furnaces (*Grossöfen*), which have the form of iron blast-furnaces. They have a

* The *Tiegelofen* is the ordinary kind of blast-furnace, from which the slag is allowed to flow off as it is formed, and the metal tapped off. The *Sumpfofen* on the other hand, is the form of furnace with a projecting fore-heath, where both the metal and slag are allowed to accumulate, and from which the slag is skimmed off, and the metal either tapped or laded out.—Ed. M. & S. M.

considerably greater capacity than the small furnaces, and consequently work with two twyers instead of one. They are not, however, more advantageous with respect to time and consumption of material than the small ones; on the contrary, perhaps not quite so much so; but they allow of a greater production in a proportionately smaller space of works, as the production increases in proportion to the capacity.

The Raw Smelting Furnaces.—The total number of smelting furnaces (*Brillenöfen*) in existence at the beginning of 1862, was 31—of which 17 were *Grossöfen* and 14 *Kleinöfen*. These were distributed as follows:—

At the	Eckardthütte	7	Grossöfen.		
„	Kreutzhütte	4	„		
„	Oberhütte	2	„		
„	Mittelhütte	1	„	and 2	Kleinöfen.
„	Kupferkammerhütte ...	2	„	„ 2	„
„	Friedeburgerhütte ...	—	„	„ 4	„
„	Sangerhäuserhütte ...	1	„	„ 2	„

Construction of the Raw Smelting Furnaces.—At each works, the blast-furnaces are arranged in a row, and enclosed under one building; the foundations, which are of Zechstein, are traversed by a common flue. The sole of the hearth is of white sandstone, and has an inclination towards the front of from 3′ to 5′. The hearth is constructed of blocks of red sandstone, 2′ square, and its sides are supported by the back-wall, but without being cemented together, so as to facilitate the removal of damaged portions when the furnace is blown out. The large furnaces have boshes, which are also built of sandstone, but the small furnaces have no boshes, the shaft (or body) immediately resting on the hearth, and either retaining the same rectangular section (slightly narrowed) up to the throat, or gradually passing into a circular section upwards. In the small furnaces there is one twyer at the back; but in the large furnaces there are two twyers, one on each side opposite each other.

The height of the twyers above the sole varies from 24′ to 28′ according to the height of the furnace. These have a very trifling inclination, are made of cast-iron, and have round nozzles that are cast very thick to prevent their being burnt off, which would soon happen, as the temperature of the furnace is so high that it is difficult to regulate the nose. For this reason the twyers are embedded in clay, which is renewed during the working as required.

Working of the Furnaces.—The use of charcoal presents no features worthy of a particular description. Experiments have lately been made for replacing it by lignite, or even raw schist.

Charge.—The schists rich in earthy matters require the addition of a flux of fluor-spar and concentration-slag. The easily smeltable schist of the lower concessions requires less fluor-spar than the schist of the upper concessions or the sand-ores; the latter are the cause of the charge at the Sangerhäuserhütte being so difficult to smelt. The action of the concentration-slag as a flux is dependent on the large percentage of FeO it contains; and, at the same time, the 8% of copper it has been stated to contain is extracted, partly by the action of the earths or the FeS in the charge separating it as CuO

or CuS, and partly by the regulus being melted out. The concentration-slag cannot be more advantageously utilised, for the slags from this raw-smelting are very poor, only containing about 0·8% Cu. It has only been used as a flux during the last few years, the first experiments in this direction having been made in 1846 and 1847. Its use also tends to economise the more costly fluor-spar; but care must be taken not to add too much, or the charge will contain an excess of iron.

At the Kupferkammer and Friedeburger works, where the fusible schist of the lower concessions is smelted, the flux added is from 1 to 1½ centners of fluor spar, and 3 to 3½ centners of concentration-slag per *fuder* of schist; at the Mansfeld and Eislebener works, to the schist of the upper concessions there is added from 4 to 5 centners of fluor-spar and 3 to 4 centners of concentration-slag per *fuder* of schist. At the Sangerhaüser works, where the charge is made to contain nearly equal proportions of sand-ores and schist and equal proportions of *dach* and *Wäschgut* (30 centners of sand-ores, 20 centners of schist, 5 centners of *dach*, and 5 centners of *Wäschgut*), 17 centners of fluor-spar used formerly to be added per *fuder* of charge. Under these circumstances the quantity of slag added must not exceed from 1 to 1½ centners, otherwise the furnace is liable to become too thickly coated. The use of an excess of fluor-spar causes too much SiO^2 to be removed, which leads to the reduction of the FeO.

At present when a fusible charge is required, and when consequently the sand-ores and schist are used nearly in the proportion of 1 : 2, and the *dach* and *Wäschgut* in nearly the same proportions (20 centners of sand-ores, 33 centners of schist, 3 centners of *dach*, and 4 centners of *Wäschgut*), the quantity of fluor spar is reduced to from 5 to 6 centners per *fuder* of charge, and the quantity of slag is increased to 3 centners. The economising of the more costly fluor-spar amply covers the cost of the carriage of the slag, which has to be brought from the Mittelhütte, near Eisleben, where the regulus obtained at the Sangerhäuser works is concentrated. The same is the case at the Friedeburger works, as the regulus obtained there is concentrated at the Kupferkammer works. It is hoped that the working expenses at the Sangerhäuserhütte will be reduced by this modification in the composition of the charge: still more slag would indeed be used to economise the fluor spar if it were possible. Besides the above-named essential materials for fluxing, the intermediate products obtained in the smelting processes (*Schweel*, residua, &c.), are also used for this purpose as far as they go. The small quantity which is produced of these (from 2·5 to 4 centners per *fuder* of charge) cannot be better utilised.

Charging.—The coke is usually charged by a measure called a *Gichtengemäss* or *Kohlengicht*, the capacity of which ranges from ⅓ to ½ a *tonne*, according to the size of the furnace. The barrels used for charging the ore have a capacity of about ½ a *centner*; the number charged at one time varies according to the working of the furnaces, but usually ranges from 9 to 11. The charging is conducted in the usual manner, with a due regard to the formation of a nose. In the large furnaces, which have two

twyers opposite each other, the fuel is charged in the middle. At the older works, the charging is by hand; but at the Eckardthütte by means of an oval-shaped sheet-iron truck, which is trammed over the throat of the furnaces as in iron blast-furnaces. The bottom of the truck opens in two parts on a hinge-bar that crosses the middle; and is placed over the throat so that the charge may fall at the sides on which the twyers are placed, leaving a long funnel-shaped space in the middle, into which the fuel is thrown. The charge is allowed to sink down from three to four feet before fresh materials are put in; and care must be taken to avoid igniting the gases escaping from the throat. By avoiding this not merely is the fuel economised, but the chemical reactions that take place in the upper part of the furnace are kept down to a *minimum*. For if the ignition of the throat brings about a loss of sulphur, it has the result of causing a silicating of the copper; and if it induces an excessive roasting of the schist a red slag will be the result, to prevent which some raw schist has to be added to the charge. The following table gives the necessary information as to the rotations of the charges:—

At the Eckardthütte where the *Kohlengicht* contains ½ a *tonne* of coke.

Fuder.	Shifts.	Charges.	Barrels of Ore charged.
	8 hours	18	180
	4½ ,,	10	100
2	12½ ,,	28	280
	10½ ,,	19	190
	5 ,,	11	110
2	15½ ,,	30	300
	7 ,,	12	120
	9 ,,	17	170
2	16 ,,	29	290

At the Kreutzhütte, where the *Kohlengicht* contains ⅔ of a *tonne* of coke.

Fuder.	Shifts.	Charges.	Barrels of Ore charged.
	4 hours	7	126
	7 ,,	9	162
2	11 ,,	16	288
	5 ,,	8	144
	5½ ,,	9	162
2	10½ ,,	17	306
	7 ,,	11	198
	5 ,,	6	108
2	12 ,,	17	306

Furnace Working.—The working operations of the furnace are essentially the same as in all *Brillenöfen*. The regulating of the nose is very difficult in working with coke and with two twyers opposite each other. In the normal condition of the furnace the nose is from 4″ to 6″ long, but it has sometimes to be shortened or lengthened according to the working of the furnace. The twyers require cooling at intervals: at the Eckardthütte, where cold-blast is used, this is done once or twice in a twelve-hours' shift—at the Kreutzhütte, where hot-blast is used, 5 or 7 times in the shift. The metal is tapped at varying intervals according to the size of the casting pits. The pits of the large furnaces are 3′ in diameter at the top, and from 1½′ to 2′ deep; and each will contain the regulus resulting from the smelting of the charge of two *fudern*—that is from 9 to 11 centners. In the small furnaces the pit will contain the regulus resulting from the smelting of one *fuder*—that is from 4½ to 5½ centners.

When a new hearth is put into a furnace, it is heated by slag from a furnace in work. The tapping-hole is only opened from 4″ to 6″ above the sole, and the slag only is first allowed to flow off so that the hearth may be heated before the regulus gets down. In smelting schist rich in zinc, the tapping-hole is kept as large as possible during the entire working, to allow the flame which escapes to carry off as much zinc-vapour as possible. The slag that first flows off contains a good deal of regulus, as it cools too quickly to permit of a separation, and is therefore put aside as residua; but when the hearth is once filled up the slag and regulus separate perfectly. The slag in the casting pits is skimmed off from time to time, and is subsequently used for building purposes. To remove the regulus from the pits, an iron hook is dipped into it while in a fluid condition, and when cooled is lifted into trucks.

Products of the Raw Smelting.—The products of the raw smelting are ore-furnace regulus, *Schweel*, residua, ore-furnace slag, and bears.

Ore-Furnace Regulus.—The 4½ to 11 centners of ore-furnace regulus taken from the pit is broken up if it is to be roasted in kilns; but if is to be roasted in closed furnaces, to obtain the sulphuric acid, it must be stamped to a coarse powder. At the Kupferkammerhütte it disintegrates of itself if water is thrown over it while hot; but this cannot be done at the Mansfelderhütte. At the new sulphuric acid works at the Eckardthütte a crushing mill has been erected for grinding this regulus. The fine waste formed during this crushing, which is called *Steindreck*, is mixed with sand or coke-dust, and is passed through the furnace again with the charge. At the Sangerhäuserhütte, where there are dressing appliances, this *Steindreck* is collected, about half a *centner* of it being got per *fuder* ground, and once a year it is treated on the shaking-frame, by which it is reduced one-third.

Schweel.—When the casting pit is first filled with slag, some of it cools on the sides of the pit, and subsequently forms a crust on the ore-furnace regulus. This crust, which is called *Schweel*, must be cleaned off; but as it still contains some regulus it is put back into the charge.

Residua.—Residua are made up of ore-furnace slag mechanically mixed with ore-furnace regulus; their origin and utilisation have been before referred to.

Ore-furnace Slag.—These slags are mostly dark coloured earthy bi-silicates. The greater portion are used for building purposes, the rest being sent on the slag-tips.

Bears.—When the copper regulus is removed from the pit a disk of very impure iron is often found underneath it, distinguished by its high percentage of molybdenum. To get off the copper regulus which adheres to this bear, this latter is repeatedly placed in the roasting heaps, by which the regulus is easily removed. At the Sangerhäuserhütte, where the regulus is neither roasted nor concentrated, the bears are roasted alone in a small heap in quantities of 150 centners at a time. The regulus adhering to them is thus loosened and is easily removed, when it is called ferruginous residua, and is added to the charge.

(*To be continued.*)

The Copper Standard.

We have frequently, during the last three years, had occasion to remark on the unmeaning nature of the copper standard given in the ticketing papers of the Cornish copper sales, and calculated by private persons from the results of the Swansea copper sales. We have more than once shown that it affords, on inspection, no notion whatever of the real relative prices given for the copper, which, when required, can only be got at from it by a troublesome supplemental calculation known to very few, and not very certain in its results, inasmuch as the two best authorities on the subject—the *West Briton* and the *Mining Journal*—constantly differ upon it, the one sometimes stating that the standard has gone up, while the other makes out that it has gone down. As evidence of this we have from time to time pointed out in our "Metallic Ore Markets" the most glaring of these discrepancies, and in looking through our volumes we find we have noticed *thirty-six* such during the last two years and a half. Even in our last number we pointed out a difference of this kind with respect to the Cornish sale of June 30th, at which, according to the *Mining Journal*, the standard *declined* £2, while according to the *West Briton* it *advanced* 16*s*. That such careful papers, thoroughly understanding the subject, should so frequently—on an average more than once a month—arrive at these discordant results, is in itself the most complete evidence of the vague nature of the problem to be solved. Of course those thoroughly conversant with the copper trade can ascertain readily enough how prices have really gone; but we believe that the great body of people interested in the subject, fail to succeed in thoroughly understanding it, although they anxiously endeavour to do so. As a rule, their mind is in a fog on the subject. As this

is obviously unsatisfactory, we shall endeavour to place the matter monthly before our readers in an intelligible form, without any regard to the old artificial standard, which has long lost the meaning and object which it originally possessed.

Although this meaning, and the origin of the standard, are very generally understood, it may not be out of place briefly to recapitulate them here.* The copper standard was formerly what the tin standard is at present—a settled or *standard* price at which the metal was agreed to be bought by the smelter from the miner, which was usually fixed at or about the selling price of metal at the time, and from which the smelter deducted the "returning charges"—that is, the estimated expenses of smelting, or extracting the metal from the ore. For many years the "returning charges" on copper ore were fixed at £2 15*s.* per ton, whatever the produce or percentage of the ore might have been. Thus, with a standard fixed at £120, the price the miner would receive for a 5 % ore, or a 10 % ore, would have been £3 5*s.* and £9 5*s.* per ton respectively—prices arrived at as follows:—

	£	*s.*	*d.*
Value of ore 5% produce, at £120 standard ...	6	0	0
Deduct returning charges	2	15	0
Nett value per ton of ore	£3	5	0
Value of ore 10 % produce, at £120 standard ...	12	0	0
Deduct returning charges	2	15	0
Nett value per ton of ore	£9	5	0

While with a standard fixed at £110, the price paid for ores of the same produce would have been respectively £2 15*s.* and £8 5*s.*, got at as follows:

	£	*s.*	*d.*
Value of ore 5 % produce, at £110 standard ...	5	10	0
Deduct returning charges	2	15	0
Nett value per ton of ore	£2	15	0
Value of ore 10 % produce, at £110 standard ...	11	0	0
Deduct returning charges	2	15	0
Nett value per ton of ore	£8	5	0

Thus, in its original meaning, the standard meant purely and simply the price given, or to be given, by the smelter for the copper; a price which rarely differed very much from the market value of the day of the metal.

Under this system, the sources of the smelter's profit—beside the 5% allowance he received by having 21 cwts. of ore to the ton, and the surplus copper got in actual smelting beyond the produce shown by the assay—were the proportion of the £2 15*s.* returning charge that was not actually expended in smelting. At this period it would

* Compare *Mining and Smelting Magazine*, Vol. I., p. 27, and Percy's *Metallurgy* (Copper), pp. 304-7.

appear that copper ores were dressed to a pretty uniform produce, which accounts for the fact that the returning charges were originally fixed the same for all ores, whatever their produce. But, bye-and bye, ores were dressed less uniformly, so that the produces differed widely; when it soon became apparent to the more acute of the smelters (it is said that the founder of the house of Vivians was the first clearly to apprehend this) that it was better to buy the low than the high produce ores on these terms. For instance, the returning charges allowed for extracting a ton of fine copper from a 5% ore (of which 20 tons were required to make a ton of copper) were $20 \times £2\ 15s. = £55$; while the allowance for getting a ton of copper from a 20% ore (of which only 5 tons were required for the same purpose) was but $5 \times £2\ 15s. = £13\ 15s.$—showing a difference of £41 5*s*. Now the real extra cost of extracting a ton of fine copper from 20 tons of 5% ore, instead of 5 tons of 20% ore, was certainly under £10; so that (at £2 15*s*. per ton returning charges, and any given standard) there was considerably upwards of £30 *extra profit* in buying the 5% ore compared with buying the 20%.

Of course the remedy for this anomaly would have been to adopt a varying, or sliding scale of returning charges, according to the nature of the ore. And if the old (and most objectionable) practice of selling by private contract at a settled standard had been continued for copper ores, as it has unfortunately been for tin ores, no doubt some such remedy must have been found. But the whole system was soon superseded by the adoption of ticketings, where the ore was sold by public competition, and bid for by the smelters according to its real value to them, and not in pursuance of any theoretical price deduced from an artificial standard and imaginary returning charges. The result of this we see every week in the difference of from 20% to 30% between the standard realised by the high produce ores sold at Swansea, and the low produce ores sold in Cornwall. Thus at the Swansea sale of July 26th, the foreign ores, making a produce of 22%, sold at a standard of £100 1*s*.; while at the Truro sale two days later, on the 28th, ores making a produce of 6⅜% sold at a standard of £127 9*s*. In both these cases the copper in the ores really sold at as nearly as possible the same price; yet the standards, by which we are theoretically supposed to know how prices have gone, varied nearly 30%. These being the facts, it seems an absurd waste of time—leaving out of the question the confusion it gives rise to—to go on gravely calculating and printing an imaginary result, which has long ceased to have any kind of meaning whatever, and which frequently, on the face of it, conveys a statement exactly opposite to the fact. For instance, at the Cornish sale of March 10th, the standard was stated at £129 2*s*., while at the sale of the following week, March 17th, it was stated at £131 15*s*. Surely uninitiated people might fairly assume that, at the latter sale, there was an *advance* of £2 15*s*., or at least some advance. But it was nothing of the kind: according to all the adepts (who for a wonder agreed) there was a *decline* of £1 10*s*.

In thus totally objecting to the present standard, it will probably be asked what we propose substituting for it. We answer that in

getting rid of the standard, even without any substitute, we are getting rid of what is not merely no possible benefit, but is an absolute misleading nuisance. If we were to confine ourselves merely to giving the price realised per unit of copper in the ore, we should have a result which, although ignoring the varying cost of returning copper from ores of varying produce, would still be much nearer the truth than the present standard is, as we can readily show by a comparison between the Swansea sale of Aug. 16th, and the Truro sale of Aug. 18th, both given in our present number. At the former sale, the standard at which the foreign ores sold is stated at £95 11*s.*; and at the latter the standard is given at £126 15*s.*—showing a difference of about 32°/₀. At the Swansea sale, the price realised per unit of copper in ore was 16*s.* 5*d.*, while at the Truro sale it was 15*s.* 8*d.*—showing a difference of less than 5°/₀. The real difference between the price given by the smelters for the copper at the two sales was really much less—probably not exceeding 1°/₀—but still, taking the price given for the copper wholly irrespective of returning charges, we have a result upwards of *six times* more accurate than by the standard calculation, the ostensible object of which is to get at a more accurate result by taking the returning charges into consideration. Hence by wholly ignoring the standard, and taking the price realised per unit of copper, we get an infinitely more accurate and intelligible result. Yet, strange to say, the mining newspapers which quote the standards so perseveringly, fail to give this simple information.

To determine accurately the *absolute* cost to the smelter of the fine copper in any given ores, it would obviously be necessary to ascertain previously the precise cost of returning the metal. Supposing this information were fairly available it would be wide of our purpose, which is not to hunt up the details of the smelter's business so as to endeavour to find out how much the metal *absolutely* costs him, but simply to keep the miner properly informed of the *relative* prices he receives, from time to time, for the metal in his ores. If we are not to be merely content to take the price per unit, and disregard the varying cost of returning copper from ores of varying richness, we must adopt some scale of returning charges; and to make any such scale other than misleading, it must, as we have shown, be a varying or sliding scale, altering with the produce. But although the produce of an ore is the main element that determines the cost of returning a given quantity of copper from it, it is evidently by no means the only element. Among ores of precisely the same percentage, some may be easy to smelt, while others are very refractory. Some may make a good copper at once, while others are mixed with substances that so deteriorate the metal as to make its refining difficult. As it would be impossible to enter into these matters without possessing and publishing all the data known only to the copper smelters, these disturbing elements must of necessity be ignored, and we must be content with ascertaining in what degree the cost of smelting copper ores varies with their percentage.

We have had for some time under consideration several formulæ suggested to us; but after weighing the matter carefully, we have

decided upon avoiding the responsibility that would be involved in making a selection of our own, and have determined on adopting the formula of Sir William Logan, which is thus explained by Dr. Percy in his *Metallurgy* (Copper), p. 499.

"Sir William Logan informs me that, when formerly engaged in copper smelting, he ascertained with great care the exact cost of each operation, and deduced the following formula for calculating the total cost of the entire process with ores of varying produce, namely 10*s.* per ton of ore, with the addition of 2*s.* for every unit; *i.e.*, 1% of produce as determined by the Cornish method of assaying. . . . In conversing with a copper-smelter not long ago, . . . he expressed his opinion that with 1*s.* 9*d.*, instead of 2*s.* per unit of produce, a more correct estimate would be obtained. I have recently had the opportunity of inspecting an actual balance-sheet of one of the largest firms at Swansea, and I found that the formula, with the modification just mentioned, gave very nearly the same sum as charged in this balance-sheet for smelting costs."

The formula we have adopted is the original one of Sir William Logan, without the modification suggested by Dr. Percy, that is, 10*s.* per ton *plus* 2*s.* per unit of produce. This gives, for a 5% ore, a returning charge (per ton of ore) of 1*l.*, with an increase (per ton of ore) of 3*d.* per $\frac{1}{8}$th per cent., and *vice versâ*. The returning charges on making a ton of fine copper will be got by multiplying the returning charge per ton of ore by the number of tons of ore required to produce the ton of copper.

In adopting this scale, we distinctly wish to avoid putting it forward as strictly true. We merely select it as being sufficiently so for the purposes of instituting a comparison between the results of various sales. If Dr. Percy's modification of 1*s.* 9*d.* instead of 2*s.* per unit were adopted, it would make a difference, as against the smelter, of about 25*s.* per ton* of fine copper made from Cornish ores of the usual produce. This difference would be slightly less with copper made from the higher produce ores sold at Swansea, but nothing worth mentioning; so that, for the purposes of comparison, one formula is equally as good as the other.

In embodying the returning charges founded on this formula in our Metallic Ore Markets, we have taken the opportunity of including all the necessary facts to make this portion of the MAGAZINE a complete record of the result of all the public copper ore sales occurring during the month.

NOTE.—Since the above was written, a very glaring instance has occurred of the positive danger of placing any reliance on calculations as to the fluctuations in the price of copper at the ticketings, made from the fictitious standard. At the Redruth ticketing on August 25th (the last Cornish sale given in our present number) 3,704 tons of ore sold at an average price of 4*l.* 18*s.*, and yielded 231 tons 3 cwt. of fine copper. This showed an average produce of 6·24 (6¼ nearly), a cost per unit of fine copper of 15*s.* 8¼*d.*, and per ton of fine copper (ignoring returning charges) of 78*l.* 10*s.* 4*d.* At the previous weekly sale at Truro, on August 18th, the produce was 5·686 (5$\frac{11}{16}$ nearly,) the price per unit 15*s.* 8*d.*, and per ton of copper (ignoring returning) 78*l.* 7*s.* 6*d.* If the charges for returning a ton of fine copper from a 6¼% ore and a 5$\frac{11}{16}$% ore were identical, the price per ton of the copper in ore would thus have shown at the sale of the 25th, as compared with the sale of the 18th, an advance of 2*s.* 10*d.* But it is obvious at

* That is, the copper would appear to cost the smelter that amount less.

sight that to extract a ton of copper from the 6¼ °/₀ ore sold at the last sale must have cost a good deal less than it did from an ore ⅛ °/₀ poorer. In fact it would cost about 15*s.* (per ton of metal) less; which is a gain to the smelter, as against the 2*s.* 10*d.* rise shown by ignoring the cost of returning. Consequently, at the sale of the 25th, the metallic copper cost the smelter fully 10*s.* per ton *less* than at the sale of the 18th.

Yet, strange to say, the mining newspapers make just the contrary statement. The *Mining Journal* makes out an advance of 10*s.*; but the *West Briton* makes it as much as 1*l.* As the higher produce ores sold on the 25th must, under any conditions, yield a ton of fine copper cheaper than the lower produce ores sold on the 18th, there could not have been a greater rise than 2*s.* 10*d.* (the difference of price ignoring returning charges), *minus* this saving to the smelter, which must have amounted to something however small. Therefore if any rational fact of either sale had been got at—such as the price per unit or price of copper in ore—the error must have become obvious. But the whole work was confined to calculating myths, which, when got, showed such an unintelligible result that even those most accustomed to them got into a hopeless fog, and published utterly misleading results.

Rachette's Lead-Smelting Furnace.

THE general interest felt in Rachette's furnace has caused great attention to be attracted to an attempt now being made at the Altenauer silver works, in the Upper Harz, to apply it to the smelting of lead. This furnace was commenced working on Tuesday, June 28th, being first filled with charcoal. At 10 o'clock in the morning the furnace was charged with slag over each twyer, and then with ore and coke. The blast was let on at 4 o'clock in the afternoon, first with a pressure of 6‴ of quicksilver, which was afterwards increased to 9‴ or 10‴. Up to Saturday morning, July 2nd, the furnace had yielded 210 centners (10½ tons) of pig-lead, and 191 centners (9½ tons) of lead regulus, from charges made up in the proportion of 10 of ore and flux to 1 of coke; while during the same period an ordinary furnace only yielded 83 centners (4 tons 3 cwt.) of pig-lead, and 77 centners (3 tons 17 cwt.) of regulus, from charges in the proportion of 7 of ore and flux to 1 of coke. No difficulty was experienced in keeping the throat from flaming, and it smoked but little. The formation and separation of the furnace products went on satisfactorily, and the furnace was tapped at regular intervals, at both ends. The only fault to be found with the working was due to the sandstone below the twyers shelling off, causing the latter to become red hot underneath; a fault which was remedied, partly by throwing water over them to keep them cool, and partly by timely replacing them by new ones. Up to July 8th, the furnace worked very well, yielding three times the produce of an ordinary furnace; but after that date, some of the twyers became much clogged, and consequently the yield decreased, although it was hoped that this might be remedied by adding a suitable quality of slag to the charge. The yield of the furnace never, however, fell below twice that of an ordinary furnace; and when the unreduced charge and unburnt coke, which had got

down into the hearth in consequence of the clogging of the twyers had been removed by partially opening the breast of the furnace, the latter again worked perfectly satisfactorily. The slag produced was not richer, and sometimes even poorer, than slags from the ordinary furnace; and the twyers appeared perfectly bright.

On August 1st, the yield was still twice as great as that of the ordinary furnaces, and the slags were much poorer in lead. The throat remained dark, and without giving off any large quantity of smoke; but the twyers required to be frequently renewed. By August 7th, however, the inner walls of the hearth had unfortunately become so irregular by indentations and projections, that it was feared it would become necessary very shortly to blow out the furnace.

Mineral Statistics for 1863.

THE Government Mineral Statistics for 1863, compiled by Mr. Robert Hunt, F.R.S., Keeper of Mining Records, were published early in August. In the introduction Mr. Hunt states that, if the returns from which these statistics are made up were all supplied with the same promptitude as is the case with the most important of them, it would be no difficult matter to publish the statistics before Midsummer. We join with Mr. Hunt in hoping that this desirable end may shortly be attained.

The following is a general summary of the quantity and value of the three great classes of minerals—metallic, combustible, and earthy—obtained in the United Kingdom during the past year, and of the metals produced from the first-named class. The value of these metals, added to the value of the combustible and earthy minerals, shows a grand total of £38,339,323.

GOLD.—The quantity of gold produced from two British Mines amounted to 552 ozs., of the value of 1,747*l.*; the returns for 1862 being 5,299 ozs., of the value of 20,390*l.*

TIN.—The tin ore (black tin) smelted in 1863 amounted to 15,157 tons, according to the returns of sales made each month by the tin smelters; the returns, as shown by the dues paid to the Stannary Court, giving 14,224 tons. This arises from the circumstance that, although the ore may have been sold in December, the dues on that ore may not be paid for a month or more after the sale. The actual increase in the quantity of tin ore raised and sold in 1863 was 830 tons, the quantity of metallic tin (white tin) produced being 10,006 tons.

COPPER.—The production of copper from British mines still exhibits a falling off. During last year 210,947 tons of this mineral were produced from 222 mines, the quantity in 1862 having been 224,171 tons. This ore yielded to the smelter 14,247 tons of copper.

LEAD.—The mines of the United Kingdom gave 91,283 tons of ore during the year, against 95,311 tons produced in 1862. Of lead we obtained from this ore 68,220 tons, the value of this metal being 1,418,985*l.*

SILVER.—The lead obtained gave 613,266 ozs. of silver; to this must be added 20,738 ozs. produced from ores so excessively rich in silver as to be returned as silver ores, making altogether 634,004 ozs., of the value of 174,351*l.*

ZINC.—The production of zinc ore has somewhat increased, the quantities sold in 1863 amounting to 13,699 tons, which gave 3,835 tons of metallic zinc, of the value of 90,889*l.*

PYRITES—SULPHUR ORES.—The quantities of these ores obtained from British mines still exhibit a decline of 95,376 tons, of the value of 62,035*l.*, being the produce of 1863, against 98,433 tons produced in 1862. The ores, however, fetched a higher price.

IRON.—Of iron ores of different kinds 9,088,060 tons were obtained. This was employed in making 4,510,040 tons of pig-iron, having the value of 11,275,100*l.*

COAL.—There has been a large increase in the production of this mineral, 86,292,215 tons having been sold and used. The export trade has been less active than usual, therefore the employment of this large quantity is entirely due to the demands of British manufacture.

GENERAL SUMMARY OF WHICH RETURNS ARE GIVEN FOR 1863.

Minerals.		Quantity.		Value. £
Gold quartz	Tons	385	...	1,500
Tin ore	,,	15,157	...	963,985
Copper ore	,,	212,947	...	1,100,554
Lead ore	,,	91,283	...	1,193,530
Silver ore	,,	88	...	5,703
Zinc ore	,,	12,941	...	29,968
Pyrites	,,	95,376	...	62,035
Wolfram	,,	13	...	67
Uranium	Cwts.	3	...	23
Gossans	Tons	4,424	...	4,576
Arsenic	,,	1,444	...	1,200
Iron ore	,,	9,101,552	...	3,240,890
Coal (sold and used) ...	,,	86,292,215	...	20,572,945
Earthy minerals (estimated).		—		1,975,000
Total value of minerals produced in 1863 ...				£29,151,976

METALS PRODUCED FROM BRITISH MINERALS.

			£
Gold	Ozs.	552	... 1,747
Tin	Tons	10,006	... 1,170,702
Copper	,,	14,247	... 1,409,608
Lead	,,	68,220	... 1,418,985
Silver	Ozs.	634,004	... 174,351
Zinc	Tons	3,835	... 90,889
Iron, Pig	,,	4,510,040	... 11,275,100
Total value of the above			£15,541,382
Estimated value of other metals ...			250,000
Total value of metals			15,791,382
COALS			20,572,941
EARTHY MINERALS			1,975,000
Grand total			£38,339,323

Abstracts and Reviews.

FREIBERG MINING ASSOCIATION.

During the last session of this Association, several interesting communications were made, among which we may note the following:—

Tin Ore in Bohemia.—Professor Cotta described the deposits of tin-ore at Graupen, in Bohemia. In this locality the grey gneiss of the Erzgebirge is traversed by a considerable number of small veins, underlying very flat, and containing tin-ore. Their size ranges on an average from 1 to 2 inches, but it is sometimes as much as 18 inches, and the neighbouring rock is very often so impregnated with ore for a distance of from 2 to 3 inches that when raised, it is worth dressing. The vein-stone is principally quartz, or *greisen* (quartz and mica), and sometimes decomposed felspar; a portion of it however contains fine crystals of tin-ore, and here and there even the vein is almost entirely made up of tin-ore. If these veins were less flat, and if they were not repeatedly heaved by more recent faults, both of which circumstances increase the difficulty of working, the profit would be much greater than it is; at present it is about 4 florins (8*s*.) per square fathom. Fortunately, the distribution of the ore, although very unequal, is yet very general. In the vicinity of Mückenthürmchen the gneiss is penetrated by syenite-porphyry (chloritic granite porphyry) and by *Zwittergestein*, which are both stanniferous. In an open working a dark mass of syenite-porphyry may be seen to be thickly traversed by rich veins of tin-ore, in which sometimes there are branches of solid tin an inch thick, while the whole mass is more or less impregnated with ore. In the absence of proper dressing apparatus, however, operations cannot be carried on on such an extensive scale nor so profitably as these facts would certainly seem to justify. The *Zwittergestein*, though so closely contiguous to the porphyry, contains so little tin that its produce cannot be determined by the dry method.

The New Metal Indium.—Oberbergrath Reich communicated some particulars on the new metal indium, discovered by Herr Richter and himself. A quantity of black blende ore from the Himmelfahrt mine weighing 200 lbs., on treatment with hydrochloric acid, and subsequent evaporation, gave about 43 lbs. of impure chloride of zinc, which, after treatment with water, left a residue containing indium, from which a few gramms of the new element were obtained. The *metal* can be reduced from the oxide by fusion in a carbon crucible with carbonate of soda and borax, and refusion with cyanide of potassium; by fusing alone with the cyanide the oxide is reduced, but only to pulverulent metallic powder. The density of two specimens, weighing respectively 327 and 343 milligrams gave 7·11 and 7·14; a rolled leaflet of 415 milligrams gave a density of 7·277 at 20·4° Cent. The colour of the metal is between tin and silver white; it is exceedingly soft and very ductile, and retains its metallic lustre when exposed to the air or in water. Hydrogen reduces the oxide to a metallic powder, which cannot be fused in the bulb-tube. On charcoal before the blowpipe, it fuses easily, colouring the flame blue, and covering the charcoal with a coating, which is dark yellow while hot, and white when cold. This coating is volatilised with difficulty when treated directly with the blowpipe flame. The oxide imparts no colour to the fluxes; when flamed with borax it gives a gray enamel; with salt of phosphorus and tin a gray pearl. The metal is slowly dissolved by hydrochloric and sulphuric acids when cold, with evolution of hydrogen; heat increases the rapidity

of the solution. It dissolves rapidly in nitric acid, even when cold and diluted. The hydrated oxide is completely precipitated from the acid solutions by ammonia and potash; the presence of tartaric acid prevents this precipitation. A solution of the metal in nitric, sulphuric, or hydrochloric acids gives no precipitate with sulphuretted hydrogen; but when dissolved in acetic acid, it is precipitated completely as sulphide of indium, which is of a fine yellow colour that on drying becomes nut brown, and when pulverised an orange colour. Carbonate of soda throws down from acid solutions a crystalline granular carbonate of indium, of a white colour. Solutions of the neutral salts of indium give a white precipitate with ferrocyanide of potassium, but none with ferridcyanide. The most striking property of the new metal, and the one which led to its discovery, is the indigo-blue line which it shows in the spectroscope. This is also given by all the compounds of the metal thus far investigated. The chloride gives the most brilliant effect, but the sulphide is the more lasting. Indium compounds colour the flame of an ordinary Bunsen's burner blue.

THE METRIC WEIGHTS AND MEASURES ACT, 1864.

THIS Act, 27 & 28 Vict., c. 107, which renders permissive the use of weights or measures of the Metric System, has the following Schedule of Tables of the values of the principal denominations of Measures and Weights on the Metric System expressed by means of the legalized denominations of Measures and Weights in Great Britain and Ireland.

MEASURES OF LENGTH.

Metric Denominations and Values.		Equivalents in British Denominations.			
	Metres.	Miles. Yards.	Feet.	Inches.	Decimals.
Myriametre	10,000	6 376	0	11·9	
		or 10,936	0	11·9	
Kilometre	1,000	1,093	1	10·79	
Hectometre	100	109	1	1·079	
Dekametre	10	10	2	9·7079	
Metre	1	1	0	3·3708	
Decimetre	$\frac{1}{10}$			3·9371	
Centimetre	$\frac{1}{100}$			0·3937	
Millimetre	$\frac{1}{1000}$			0·0394	

MEASURES OF SURFACE.

Metric Denominations and Values.		Equivalents in British Denominations.		
	Square Metres.	Acres.	Square Yards.	Decimals.
Hectare, *i.e.* 100 Ares ...	10,000	2		
		or	2,280·3326	
			11,960·3326	
Dekare, *i.e.* 10 Ares ...	1,000		1,196·0333	
Are	100		119·6033	
Centiare, *i.e.* $\frac{1}{100}$ Are ...	1		1·1960	

MEASURES OF CAPACITY.

Metric Denominations and Values.	Cubic Metres.	Equivalents in British Denominations. Quarters.	Bshls.	Pecks.	Gals.	Qts.	Pts.	Decimals.
Kilolitre, *i.e.* 1,000 Litres	1	3	3	2	0	0		0·77
Hectolitre, *i.e.* 100 Litres	$\frac{1}{10}$		2	3	0	0		0·077
Dekalitre, *i.e.* 10 Litres	$\frac{1}{100}$			1	0	0		1·6077
Litre	$\frac{1}{1000}$							1·76077
Decilitre, *i.e.* $\frac{1}{10}$ Litre ...	$\frac{1}{10000}$							0·176077
Centilitre, *i.e.* $\frac{1}{100}$ Litre	$\frac{1}{100000}$							0·0176077

WEIGHTS.

Metric Denominations and Values.	Grams.	Equivalents in British Denominations. Cwts.	Stones.	Pounds.	Ozs.	Drams.	Decimals.
Millier	1,000,000	19	5	6	9		15·04
Quintal	100,000	1	7	10	7		6·304
Myriagram	10,000		1	8	0		11·8304
Kilogram	1,000			2	3		4·3830
		(or 15432·3487 grains)					
Hectogram	100				3		8·4383
Dekagram	10						5·6438
Gram	1						0·56438
Decigram	$\frac{1}{10}$						0·056438
Centigram	$\frac{1}{100}$						0·0056438
Milligram	$\frac{1}{1000}$						0·00056438

FACTS CONCERNING THE OIL WELLS.*

THE interference of one oil well with another is becoming a common occurrence upon Oil creek. It is, to say the least, very vexatious to the lucky owner of a flowing or pumping well, who has laboured day and night, expended the earnings of years of toil and self-denial, and just when he is on the highway to boundless wealth, to have his hopes crushed in a few hours, by the striking of a well near his own, that taps it, and turns his golden dreams of wealth into limpid, valueless water. Notwithstanding the great disappointment consequent upon a disaster of this kind, the true operator takes it coolly. He well knows, that no effort or foresight of his can remedy the matter, and so, if he fails to effect a compromise, or sell out, he seeks another location, and very frequently interferes with some one else in like manner.

It would seem, in the minds of many, to be a settled fact that any flowing or pumping well can be tapped or deprived of its supply by boring another well upon some particular side of it. As to which side or in what direction this is, we are not clearly informed. No

* From the *Oil City Register.*

one, as yet, has satisfactorily ascertained the bearings of the exact oil veins.

We might give the opinions of some who profess to know the exact directions in which an oil vein is located, but we consider it no part of our duty as a truthful journalist to theorise just at the present, but to give the facts as they occur, so that the intelligent reader can form his own conclusions. If the operator can get the exact bearings of the oil vein, to tap or interfere with any well is an easy matter. But we are of opinion that too many exceptions have occurred to render this general received theory or hypothesis, a fixed fact. We proceed to give a few cases in point.

Upon the M'Ilhenny farm, in the same locality, there were some nineteen wells. But few or any of these interfered with each other. All of them produced more or less oil. Finally, a well, the Olmstead, was bored almost in the centre of these. *The consequence has been the stoppage of all these wells*, and the Olmstead at one time, not long since, flowed 300 barrels of oil per day. How much it is producing at present, we are not advised, but we believe it does not vary greatly from that amount.

Upon the Blood farm, a well has been bored adjoining the Duncan well, in such close proximity that the bottom of the derricks touch each other: in fact the two wells are not over twelve feet distant. The new well has not only failed to get any considerable quantity of oil, but has not succeeded in tapping the Duncan, though it has been sunk several feet deeper. The owners of the Duncan well doubtless feel rejoiced at this contradiction of the accepted theory.

In the case of the Phillips and Woodford wells, when both are tubed, the Phillips well runs pure oil, while the oil from the Woodford is "rily" or mixed with about forty per cent. of water. These two wells are located only a few yards apart in an almost direct line.

The Hammond well, on the widow M'Clintock farm, is surrounded by wells in every direction. Yet at the commencement, it flowed at the rate of between five and six hundred barrels of oil per day. A strong stream of water, from what direction has never been fully ascertained, literally drowned it out, and it ceased flowing after yielding its greasy treasure in such copious abundance for a short time. But, strangely enough, the latest advices from this well, represent that the pump is rapidly gaining upon the water, oil has come up in the proportion of about one-third, there is a good show of gas, and the indications are that this well will soon approximate, if not exceed its former supply. Such is the reward of perseverance.

The cases we have mentioned are aggravated ones. Some of these occurring from the reason that parties had leased wells, or operated the wells already bored, with the intent of tapping or interfering with them, in order to be enabled to levy black mail.

How all this loss to individuals, and injury to the general trade, could have been avoided, had the parties felt disposed to exercise toward each other a more compromising and Christian feeling, the reader can imagine. But then, the sole object of many men here, as elsewhere, is to make money; and too many think the end justifies the means. The necessity of some legislative enactments, to effectually remedy this matter, if such a thing be possible, is keenly felt, and we trust that measures will be taken to check these cut-throat operations. We can see no reason why the law should not protect a man's property from injury by his neighbour as much in an oil well as in anything else.

ANALYSES OF LEAD ORES.

THE following analyses of lead ores have been made at the *Ecole des Arts et Manufactures et des Mines de Liége*, under the direction of M. Is. Kupferschläger. The results are in a tabulated form for the sake of convenience.*

Analyses by Wet Method.	*a.*	*b.*	*c.*	*d.*	*e.*	*f.*
Volatile matters	—	20·00	—	—	—	—
Insoluble ditto	—	5·30	—	16	—	—
Lead	18	61·50	42	15	56·66	29·5
Sulphur	17	9·80	—	—	—	—
Lime	21	3·40	—	1	—	—
Iron	19	—	—	20·90	—	—
Zinc	25	—	—	17·00	—	—
Copper	—	—	—	13·20	—	—
Antimony	—	—	—	6	—	—
	100·00	100·00	42·00	99·10	56·66	29·5
Lead: by Volumetric Method	20·00	63·00	43·40	16·00	57·84	31·32
„ by Dry Method	18·00	60·00	40·60	—	55·70	25·10

a. Galena from Diepenlinchen.—Ore in lumps the size of an egg, consisting of a mixture of galena, pyrites, blende, and limestone, with some crystals of cerusite. Colour variable, leaden-grey, greenish-brown, with a metallic lustre; of a medium density and hardness, and powder grey. Effervesces with acids.—Average result of four assays.

b. Galena from Diepenlinchen.—This sample was in a fine powder, with a considerable metallic lustre and of a deep blue colour.—Average result of four assays.

c. Decomposed Galena and Blende from Diepenlinchen.—Ore in large pieces of different colours.—Average result of four assays.

d. Antimonial Galena from the same locality.—Ore in irregularly sized pieces of a deep blue colour.—Average result of two assays.

e. Galena from Bremt.—Ore in pieces the size of the fist; colours grey, yellow, and red, arising from a mixture of pyrites, clay, and oxide of iron. Lustre dull, fracture unequal, and texture radiated-fibrous. Effervesces with acids.—Average result of nine assays.

f. Galena with Crystallised Limestone, found in fissures in a "Stock-werk."—Ore in pieces the size of the fist. Four distinct layers could be distinguished: (1) crystallised limestone; (2) galena with a lamellar texture; (3) is of a brass yellow colour and of fibrous texture; (4) is greenish and has also a fibrous texture;—the two latter being sulphides of iron. Density rather considerable; hardness varying. Powder grey; strongly attacked by acids.—Average result of two assays.

STEEL SHOT AND ARMOUR-PLATES.

THE experiments at Shoeburyness, by the Iron-Plate Committee, on steel shot and armour-plates have been particularly interesting during the past month. The shot was principally supplied by Mr. Krupp, John Brown and Co., Mr. Attwood, and Messrs. Sanderson

* We gave some analyses of zinc ores, done under the same direction, in our July number of this year.

Bros, and Co. In these experiments Mr. Krupp's metal has been the best; John Brown and Co.'s the next best, and close upon Mr. Krupp's; and Mr. Attwood's have been next to Mr. Brown's. There has been, however, a wider margin between the performance of Mr. Brown's and Mr. Attwood's shots than there has between Mr. Brown's and Mr. Krupp's. Mr. Brown's metal has been very close upon the excellencies of Mr. Krupp's, though Mr. Krupp's price per ton is, it is stated, more than half as much again that of Mr. Brown's—a difference of cost not justified by the difference in performance. Mr. Brown has been supplying his steel shot to the committee at 35*l.* per ton, while the cost of Mr. Krupp's metal is stated at 50*l.* It will be impossible, however, to arrive, with any degree of certainty, at the merits of the various shot till the committee give up their present practice of allowing each competitor a plate to himself, and then taking as their basis of calculation that each plate is precisely alike in its powers of resistance. Nothing can be wider from the fact than the inference of an uniform standard of resistance being offered by all the plates alike; for no two of the best plates made by the best firms are ever found under fire at Shoebury to be equal in strength. To have a fair trial of the steel shot, Messrs. Krupp, Brown, and Attwood should each fire their projectiles at the same plate, when it could at once be seen which was the best projectile, and whether it is true that the undoubted excellence of Mr. Krupp's metal has in these experiments been aided to a certain extent by his having to fire against a plate which is said to have been more brittle than the rest. In the face of the enormous differences which are known to exist in the resistance offered by armour-plates of the same thickness it seems impossible to arrive at a satisfactory conclusion on this subject till the rival competitors are made to fire at the same target.

As regards the armour-plates, the most interesting experiment was upon a target representing an iron-clad built to scale upon the principle generally adopted on the Continent, and more especially by the French. How 6 inch and 4½ inch plates will stand under fire of heavy guns was, of course, as well known before the experiment commenced as at its close. The trial, therefore, was simply undertaken to test the continental system of small plates fastened with a large number of screws instead of bolts. These screws were supplied direct from France, and were used so numerously about the plates that at no part could a shot strike without having its circumference within two inches of no less than four of them. As either screw or bolt holes in the plates are evils and recognised sources of weakness, it was believed that the plates would soon yield under fire and crack in all directions; but the absolutely perfect manufacture of the iron made by the Millwall Company disappointed this expectation, for, though the target was penetrated and destroyed more absolutely than any target that has ever yet been tried at Shoebury, not a single crack was visible in the iron from first to last. As to the advantages of fastening with screws instead of bolts, the screw system was shown to be infinitely superior to the other, for nothing that shot or shell could effect could make the screws loosen their hold, and, though the target was perforated like a sieve in all directions, the screws from first to last showed no signs of yielding. Their metal was as wonderful as that of the plates, which were of the toughness and consistency of copper, rarely even bending under the tremendous blows which pierced them like paper. Some of the screws were struck, and were twisted almost literally into knots, without showing a sign of fracture in any part. Their metal was of that peculiarly excellent kind made with charcoal from the ores of the Island of Elba.

During these experiments some of the shot used was of iron chilled cast on Captain Palliser's system, the great superiority of which over the common iron castings was curiously illustrated by an accident. It was intended at the conclusion of the experiments to try a 300-pounder steel shot from the 10½ inch gun; but, as it happened, one of ordinary cast iron was taken by mistake. This, though propelled with a 35 lb. charge instead of 50 lb. (the reduction of power only giving the velocity which the shot would have had at 1,500 yards range), broke up almost harmlessly against the target—making a severe dent, but nothing more—whereas the 250 lb. chilled shot of Captain Palliser, with the same charge, went clear through everything. The practical applicability of the new process of casting these shot in cold iron moulds, so as to chill and contract their outer surface into almost the hardness of steel, still remains to be proved. Of the increased hardness of the shot there is no doubt, but it is still so much inferior in this respect as compared with steel that it has yet to be proved whether it can be made as cheaply relatively to steel as the difference in its effectiveness. In every case the best Pontypool iron is used for these chilled shot; but in some cases the shot is found to be over chilled, and the outer surface so contracted over the inner mass as to shatter like glass in the gun on the concussion of the explosion—blowing out in fragments. This is a serious military defect. Another defect of a commercial nature is that the iron moulds are liable to crack after some 15 or 20 shots have been cast in them; so that as the value of the cost of the mould has, of course, to be added on to the price of the shot it has turned out, this makes them expensive. It may be expected that with increased experience in their manufacture these difficulties may be surmounted. Indeed it would be very surprising if the making of a metal approximately equal to steel, at the price of cast iron, were to be accomplished offhand, if, indeed, it ever can be accomplished.

REPORTS OF THE GOVERNMENT INSPECTORS OF COAL MINES.

From the reports for 1863 of the Government Inspectors of Coal Mines, we find that the number of deaths during that year amounted to 907, against 1,133 in 1862, being a decrease of 226. The number of separate accidents has increased by 19—from 738 to 757. The number of accidents in ironstone mines was 87, resulting in 91 deaths—being an increase of two accidents, and a decrease of 14 deaths. The reports contain little more than technical details.

In Mr. Dunn's district (North Durham, Northumberland, and Cumberland), the explosions of fire-damp have been particularly fatal, 4 explosions having resulted in 33 deaths. Each accident from falls of roof and in shafts resulted in only one death.

In Mr. Atkinson's district (South Durham), there was only one explosion of fire-damp, resulting in one death. The accidents from falls of roof each resulted in one death, and those in shafts in two deaths.

In Mr. Dickinson's district (North and East Lancashire), 5 explosions of fire-damp resulted in 8 deaths, and 38 accidents from falls and in shafts caused 42 deaths.

In Mr. Higson's district (West Lancashire and North Wales), the number of deaths from fire-damp was 24, resulting from 9 explosions. The other accidents were unimportant.

In Mr. Morton's district (Yorkshire), there was but one explosion of fire-damp, causing one death. Each accident from falls of roof resulted in one death, and 10 accidents in shafts in 17 deaths.

In Mr. Hedley's district, now Mr. Evan's (Derbyshire), the deaths resulting from fire-damp and in shafts were one to each accident; 25 accidents in shafts caused 26 deaths.

Mr. Baker states that in his district (South Staffordshire), 4 explosions of fire-damp caused 7 deaths, 54 falls of roof 55 deaths, and 13 accidents in shafts 15 deaths.

In Mr. Evan's district (South Wales), now under the inspection of Mr. T. G. Wales, the explosions of fire-damp were, like those of 1863, exceedingly fatal, 7 explosions having resulted in 66 deaths. In the cases from falls of roof and in shafts, each accident resulted in one death.

THE YIELD OF COAL IN SOUTH STAFFORDSHIRE.

In April last a paper was read by Mr. Rupert Kettle, at a meeting of mine owners and mine agents at Dudley, on the yield of the ten-yard coal, and the best mode of increasing it, having regard to the safety and economy of the working. This paper gave rise to some contradictory discussion, and it was decided to have it at once printed and distributed. This has been done, and a meeting was held at Dudley, on August 2nd., for the purpose of discussing it. Mr. Johnson stated that he trusted he should be able to show that Mr. Kettle had made a great mistake, in charging the South Staffordshire coal-owners with a loss of 23,907 tons per acre, in a seam which cannot, by any possibility, contain more than 38,000 tons per acre. In the first place, Mr. Kettle puts the weight of a cubic foot of thick coal at 82½ lbs, which Mr. Johnson considers to be wrong to the extent at least of 5½ lbs. per cubic foot, which would reduce Mr. Kettle's estimate by 2,992 tons per acre. Then as to the number of cubic yards per acre. Mr. Kettle reckons this at ten yards thick of clear gettable coal on an average all over the district; making no allowances for faults, thin places, loss by holeing drift, or loss by coal left for a roof. Mr. Johnson states that he has put himself in communication with about thirty mine agents scattered all over the thick coal district, requesting them to forward him the correct net thickness of gettable coal in two or three places in each of the square miles represented on the accompanying diagram. The replies to these inquiries brought out eighty-two measurements, the average of which was 8 yds. 1 ft. 6 in. Taking, then, the mean thickness at 8½ yards, this would reduce Mr. Kettle's estimate still further by 7,258 tons. After some remarks on the advantages of the pillar-and-stall mode of working as compared with the long-wall, Mr. Johnson concluded by hoping that every argument on the subject might be exhausted rather than the mining public should be led to believe that 23,907 tons, or even one-tenth of that quantity, of thick coal per acre is wasted in working the South Staffordshire coal-field. At the close of the meeting it was resolved to appoint a commission to ascertain the specific gravity of the coal in the thick coal seams, and obtain any further necessary information upon the various subjects touched upon in Mr. Kettle's paper.

Extracts, Notes, and Memoranda.

MINING AND QUARRYING.

CHARGING, TAMPING, AND BLASTING HOLES.—The *Bulletin de la Société de l'Industrie Minérale* gives a series of rather curious opinions as to the charging, tamping, and blasting of mining-holes—but principally with regard to the use of the wooden tamper. M. Parran, professor at the St. Etienne Mining School, pronounces in favour of wooden tampers, even in the hardest rocks, and is also strongly favourable to the use of the safety-fuse. M. Imbert, manager of the Rivè de Geer collieries, does not consider the wooden tamping tool efficient for very hard rocks, and also objects to the use of the fuse. M. Lombard, engineer of the Monthieux collieries (Loire), approves of the wooden tamper and the safety-fuse in preference to the needle, except in sinking pits, where, in case of any accident in drawing up the miners, it is more difficult to extinguish the fire. He also recommends that the tamper shall be smaller when of wood than of iron, and also that the powder be always placed in a cartridge instead of thrown loosely into the hole. M. Evrard, engineer of the Framont mines (Vosges), approves of wooden tampers everywhere except in very hard rocks, where a metallic tamping tool must be used. He is also in favour of the fuse. M. Etienne brought about the adoption of a wooden tamper at the Stiring collieries (Moselle) in consequence of several accidents having occurred with iron tampers. During the three years since the former has been adopted, 47,340 holes have been blasted at the pits of the Stiring Company without a single accident. The tampers are of beech, cost 2*s.* 2*d.* each, and last three months. M. Levy, manager of the works of the Coal Company of the Moselle, is in favour of the wooden tamper and the safety-fuse in all cases. He would also insist on the use of cartridges, and forbid holes that had missed fire being bored-out under any circumstances.

A NEW CRUSHING MILL.—Mr. Fauchery, of San Francisco, proposes a form of crushing mill, in which the jaws are so arranged as to resemble an enormous pair of pincers, working crosswise, the motion being applied by an oval wheel, made to revolve between the arms, closing the jaws at each revolution, the process of opening being managed by a spring.

SUPPLYING HIGH PRESSURE PURE AIR FOR THE LIGHTS IN MINES.—In supplying air to lights in mines, the Rev. W. R. Bowditch, of Wakefield, proposes to condense air by a pump, or other suitable means, and convey it in pipes to a receiver, and thence to the light to be supplied, or directly from the condenser to the light. The light, naked or in a safety-lamp, is placed in a lantern, which has an aperture for the admission of the pure air, and one for the exit of the surplus air and products of combustion. The condensed air is conducted through a pipe, which fits tightly into the lantern, and by this air combustion is supported. The air being supplied to the lantern under pressure, prevents the entry of fire-damp or any other dangerous gas that may surround the lantern. Air under pressure is apt to extinguish lights supplied with it, and to flow to waste if the current be not regulated; to prevent this it is passed through a pipe, obstructed by screw-plugs, or by other suitable impediments, so that its flow may be regulated according to the supply needed.

IMPROVED QUARTZ MILL.—Mr. Hinkle, of San Francisco, has invented a mill on a new principle, in which a crushing machine is used for the first reduction of the rock to about the size of marbles. From this it passes into a reduction mill, which consists of a close iron cylinder, within which wheels, similar to the wheels of a Chili mill, are made to revolve with a rapid motion, reducing the ore to a fine pulp in a very short time.

CONTINUOUS CONCENTRATING DRESSING MACHINE.—The New York papers refer to a new mining invention for separating ores, called "Stetefeldt's Continuous Concentrating Machine." It is not apparent from the description whether this is a jigging machine, or an improved form of the shaking-table, but it is said to possess the following advantages:—1st. It discharges the concentrated ore continuously, so that it need not be stopped and emptied, as is the case with shaking-tables; 2nd. It makes a remarkably clean division of the ore, discharging (for instance) galena, pyrites, and zinc blende at their separate points, and almost entirely obviating the necessity of repeated dressings. It can be adjusted to suit any kind of ore, and to accomplish any desired division, provided there be a difference of specific gravity between the substances to be separated. Later accounts describe this invention to consist of a shaking-table, provided with two or more rotating beds, arranged one above the other, in such a manner that by their action the pulverised ore, running down over them, is separated automatically, according to its specific gravity. The separation can be continued to any desired degree by simply increasing the number of rotating beds.

IMPROVED AMALGAMATOR.—Mr. C. Camp, of San Francisco, proposes an amalgamator, in which the crushed quartz is ground between annular disk mullers and spiders. These mullers are revolving, with a horizontal shaft, on vertically placed spiders. By a peculiar arrangement four mullers and four spiders are applied, attaining by this means four pairs of grinding discs, so that such a pan, of the same diameter as the ordinary pans, has four times as much grinding surface, and should, therefore, grind four times as much quartz pulp. The mullers and spiders are brought into contact, and kept so by a constant pressure. The amalgamating operation takes place in the lowest part of the pan, where the pulp is pressed through the quicksilver by aid of the centrifugal force of the mullers, and the arrangement is so contrived that the entire pulp ground between the mullers and the spiders is forced to go through the quicksilver again to the mullers, for re-grinding, and so on until the process is completed. The pan has a half cylindrical trough form, and is made of cast-iron, and the advantages claimed for it are that quartz pulp is more regularly ground and amalgamated, and the quicksilver is not injuriously affected by any moving machinery.

METALLURGY.

MECHANICAL PUDDLING.—Mr. Harrison, of Tudhoe, Durham, proposes a method of imparting, by mechanical means, lateral and transverse motion to the puddling tool, this motion being produced simultaneously, being continuous, and also as regards the transverse motion being reversible by means of self-acting gear. The requisite power is obtained directly from a small engine constructed for the purpose, worked either by steam, compressed or heated air, or by water. This engine is placed immediately over the puddling furnace and in a line

with the centre of the furnace door, and is mounted on a pivot so that the cylinder may be turned round horizontally upon its centre to any required angle. To the sides or bed plate of the engine a projecting arm is attached, of such dimensions that its extremity shall overhang the front of the furnace. From the point of the projecting arm a bar is suspended (the suspension rod) of such length that its lower extremity will hang opposite the working hole of the furnace door. The piston rod of the engine is attached to a connecting rod lying in the same line, and the end of which is connected by a pin to the suspension rod, so that when the engine is put in motion the suspension rod will be made to vibrate to and fro. The lower end of the suspension rod, which hangs before the working hole in the furnace door, is provided with a hook upon which the outer end of the puddling tool is made to rest, and by which it is retained in its proper position, the other end of the tool being introduced into the furnace. The vibratory motion of the suspension rod thus communicates a corresponding motion to the tool, which is made to work backwards and forwards over the hearth of the furnace. This is the longitudinal motion. The pivot on which the cylinder rests is surrounded by a circular detent wheel or ratchet with pawls; and at each stroke of the piston the pawls are raised, and the detent wheel made to move forward one tooth. The cylinder is thus caused to rotate horizontally, carrying with it the projecting arm, suspension rod, and tool, by which a transverse and longitudinal motion is imparted simultaneously to the tool and every part of the bottom of the furnace successively brought under its operation. The cylinder is permitted to describe a segment of a circle sufficiently large to allow the tool to traverse the whole of the furnace bottom, and on arriving at either extremity the action of the pawls in the ratchet is reversed. The form of the puddling furnace may be modified, and the size increased, so as to receive a working tool on either side alternately; in the latter case both ends of the piston rod must be furnished with connecting rod, suspension rod, and projecting arm. The metal may be melted in the usual manner, or in a separate furnace; and after being worked by the tools until it comes to nature, it is to be balled and withdrawn from the furnace by manual labour as commonly practised.

Converting Vessels used in the Manufacture of Steel and Iron.—Mr. D. Adamson proposes some improvements in the converting vessels employed in the manufacture of steel and iron by the atmospheric process, consisting particularly in an improved arrangement and disposition of the passages for conveying the atmospheric air, gases, or steam to the interior of the converting vessel. These passages are made of blocks of fire-brick or other suitable material, and are placed in such a position that the air, gas, or steam when forced into the converting vessel by a blast engine of the ordinary construction, or by the pressure of the steam from a steam boiler, may agitate the molten metal so as more effectually to decarbonise and purify it; the air passages are arranged at one or both sides of the converting vessel, and are placed horizontally or diagonally towards the bottom of the vessel, so as to prevent the molten metal descending through them, thus increasing the durability of the converting vessel and other parts of the apparatus.

Erosion of Lead by Insects.—A letter to the *Times*, signed "Y," states that the erosion of lead by certain species of insects is not generally known, and may be extremely mischievous. Not long ago it attracted the attention of the French Academy of Sciences, and several communications upon it have been published in their proceedings, the

Comptes Rendus. In 1858 Marshal Vaillant exhibited to the Academy leaden bullets brought back from the Crimea, in some of which the larvæ of insects had excavated circular passages three or four millimetres in diameter; but nothing of the kind had been detected in the cartridges of the Russian army in the Crimea, and the insect which damaged the French cartridges appears to have been imported in the wood of the cases in which they were packed. The insects do not eat the lead, but simply bore it out. In 1833 Audouin exhibited to the Entomological Society of Paris sheet lead from the roof of a building deeply grooved by insects. In 1844 Desmarest mentioned erosions of sheet lead by a species of Bostriche (*B. Capucina*), and illustrated the fact by cartridges from the arsenal at Turin. Mr. Westwood, the well-known British entomologist, has recorded observations on the perforation of lead by insects. M. Bouteille, curator of the Museum of Natural History at Grenoble, sent to the French Academy of Sciences from the collection under his charge specimens of cartridges gnawed by insects, which were found *in situ*, and the reports on the subject by Marshal Vaillant, de Quatrefages, and Milne Edwards, state the insect to be *Sirex gigas*, a large hymenopterous species, which, in the larva state, lives in the interior of old trees or pieces of wood, and which, after the completion of its metamorphosis, quits its retreat for the purpose of reproduction. Scheurer-Kestner, in 1861, communicated to the French Academy a notice of the erosion by an insect of the sheet lead of a new sulphuric acid chamber. The creature was caught in the act of escaping through the lead, having been imprisoned between it and a wooden support. But perhaps the most interesting and important case of insect erosion is that of stereotype metal, which was communicated in 1843 by M. du Boys to the Agricultural Society of Limoges.

MINERALOGY AND GEOLOGY.

THE MINERAL PARISITE.—At the meeting of the Academy of Sciences, on August 8th, MM. Damour and H. Sainte-Claire Deville communicated the following analysis of this mineral, which is formed of the carbonates and fluorides of cerium, didymium, lanthanium, and lime (and which was first analysed by Bunsen):—

Carbonic acid	0·2348
Cerous oxide	0·4252
Oxide of didymium	0·0958
Oxide of lanthanium	0·0826
Lime	0·0285
Oxide of manganese	traces
Fluoride of calcium	0·1010
Fluoride of cerium	0·0216
	0·9895

Which gives the formula:—

$$2CeOCO^2 + (\tfrac{1}{2}DiO, \tfrac{1}{2}LaO)\,CO^2 + (Ca, Ce)\,Fl.$$

COAL AND IRON DISTRICT OF THE WEST OF SCOTLAND.—At the Institution of Mechanical Engineers, Mr. Wm. Moore, of Glasgow, read a paper "On the Principal Seams of Coal and Ironstone in the West of Scotland Coal-Field," in which he stated that the valuable seams in the Glasgow coal-field are situated in the counties of Lanark, Stirling, Dumbarton, Renfrew, and Linlithgow, and lie between the New Red Sandstone and the Hurlet coal. They are divided into upper and

lower series of minerals. Those seams lying above the Garnkirk limestone of Garnkirk and Bedlay form the upper series, and those lying under the Possil and Cowglen limestone form the lower series. All the principal seams of ironstone under the Possil limestone are in the lower series. It is from the upper series that the coals have been taken for the supply of household, manufacturing, and iron-smelting purposes, during almost the whole history of the coal-field, and the upper seams in this series are collectively known as the Glasgow and Monkland seams, extending over an area comprising about 37 square miles, more or less interrupted by faults. There are also several minor seams of coal in the upper series, which are, however, chiefly local, worked only in the immediate districts in which they are found. The main supply of ironstone for the use of the Scotch ironworks comes from the two Possil ironstones, the two Garscadden blackband ironstones, and the Paisley ironstone. The paper contained a variety of details with respect to the modes of working pursued in the different pits, and also the following statistics:—The whole Glasgow mineral district contains 111 blast-furnaces, producing about 900,000 tons of pig-iron per annum, and consuming about 2,500,000 tons of coal, 1,134,000 tons of ironstone, and 445,000 tons of limestone. The entire district contains about 260 collieries, which raised annually about 8,500,000 tons of coal, or nearly 77 per cent. of the whole produce of Scotland.

Geological Survey of the Sandwich Islands.—It has been suggested that the presence of the representatives of the Harvard University and Smithsonian Institute of Washington, at Honolulu, should be availed of as an opportunity for procuring a geological survey of the islands, and much local interest is felt from the probability that the Hawaiian Government will give the necessary authority for settling the oft-mooted question, not only whether gold exists in Koolau, but also whether there is coal or other mineral.

Formation of Granite.—A curious controversy has been recently raging in the *Mining Journal* between Mr. Nicholas Ennor, Mr. John Jones (of Blaenporth), and some anonymous persons, as to the formation of granite, which is principally remarkable for the extraordinary amount of ignorance displayed as to all our recent advances in knowledge in this direction.

The Rocks of West Cork.—One of the writers taking part in this controversy, signing himself "Ingeniero de la Minas," and dating from County Cork, Ireland, avails himself of the opportunity of stating that "little or no reliance can be placed on the Maps and Sections of the Geological Survey of Ireland, inasmuch as almost one-half of the county of Cork is represented as being of a sandstone formation, when, in reality, it is a clay slate, and to the alteration of which the attention of the Government Surveyors has several times been called, it being detrimental to the Mining interests of the county." For a geological critic surely this complaint (which he has made a dozen times already) displays an amazing amount of ignorance. He confounds the *geological age* of rocks with their *mineral structure*, matters which have no necessary connection with each other. All that the survey maps state is that the rocks of the West of Cork are synchronous with the Old Red Sandstone rocks of England, from which it by no means follows that their mineral character should be expected to be similar. But the most curious part of the matter is that the same complaint would apply to Cornwall and South Devon, the rocks of which are also coloured as synchronous with the Old Red. Yet we

have never heard the survey charged with misleading us into the belief that all the slate-rocks and killas of Cornwall are sandstones. Surely being put in the same (Geological) boat with Cornwall and South Devon cannot be very "detrimental to the Mining interests" of West Cork.

MISCELLANEA.

NORTH OF ENGLAND INSTITUTE OF MINING ENGINEERS.—The annual meeting of this institute was held on August 4th, Mr. N. Wood, President, in the chair. The President introduced Mr. Howell, who is about to visit the district in order to complete the Geological Survey for the Ordnance Maps. The Secretary then read the annual report, and the report of the Finance Committee, both of which showed the institute to be in a prosperous condition. After some remarks expressive of the regret that the coal trade does not contribute to the funds of the institute, the President referred to the good effects attending the meeting which the members of the institution held in Birmingham two years ago, and suggested that it might be well to hold a similar meeting next year, either in South Wales or in Manchester. A resolution was passed "That the council of the institute be directed to take into consideration the propriety of holding one of the general meetings of the institute in some locality most convenient and proper for the objects of the institute, and report their labours to the next meeting of the institute."

THE NATIONAL ASSOCIATION FOR THE RELIEF OF BRITISH MINERS.—Mr. Charles Colwell, who acted as honorary secretary to this association, has issued a short address, together with the copy of a letter to the Charity Commissioners, raising the question as to what has become of the funds subscribed to it. In his letter to the Charity Commissioners, Mr. Colwell explains that contributions to some extent resulted from the issue of the association's prospectus; and all looked well, when he happened to discover wrong doing amongst the paid servants. He immediately sought inquiry and investigation by the council, and established a case of fraud and conspiracy, when the individuals were immediately suspended, and the books and papers were taken possession of by the auditors. Mr. Colwell alleges that he was prepared to prove other cases of fraud, and endeavoured to do so, but the advisers of the council preferred secresy, and caused the whole of his undertaking to be unceremoniously annihilated, without his consent. No account has been published, although he has frequently solicited publicity of the receipts and disbursements. He complains that a charitable institution, publicly spoken of by its president and council as being unsurpassed, if not unequalled, in this or any other country for its humanity and extent of operation, has been suddenly quashed, its funds improperly lavished, and no account rendered to the public.

A correspondent informs us that an exhibition is to be held at Sierra Leone in December next, which will include a large collection of minerals from the interior and all parts of the West Coast of Africa. We have been promised a full description of these, and the localities from which they were obtained, which will appear early in the year.

*** Pressure on our space this month compels us to omit our Bibliography and the greater part of our Patents.

Patents relating to Mining and Metallurgy.

(Compiled from Commissioners of Patents' Journal.—Subject matter only given.

UNITED KINGDOM.

Application for Patents from July 30th to Aug. 29th.

1,904 (1864). F. E. B. Beaumont, Machinery for driving galleries through stone or rock.

1,907 (1864). R. A. Brooman (com. from F. C. Armelin), Manufacture of artificial fuel.

1,925 (1864). J. H. Johnson, Apparatus applicable to the ventilation of mines.

1,945 (1864). J. Gothard and H. Garland, Construction of furnace bars and other apparatus for the removal of slag from furnaces.

1,956 (1864). G. Leyshon, Manufacture of tin and terne plates.

2,007 (1864). A. Alison and J. Shaw, Improved elevators for raising water and minerals from collieries and mines.

2,031 (1864). R. A. Brooman (com. from F. M. E. and P. Martin, Manufacture of cast steel.

2,056 (1864). J. Grantham, Manufacture of compressed fuel.

2,100 (1864). R. A. Brooman (com. from A. Dumas), Apparatus for firing charges in mines.

2,104 (1864). R. Hill, Manufacture of iron and steel.

2,105 (1864). C. G. Landborg, Extracting oil from coal and other bituminous substances.

2,116 (1864). P. A. Le Comte de Fontainemoreau (com. from C. Pasquin), Manufacture of artificial stone.

Patents Sealed from Aug. 1st to Aug. 30th.

556 (1864). H. Cochrane, Moulds for casting metals.

454 (1864). E. A. Cotelle, Apparatus for concentrating and distilling sulphuric and other acids.

580 (1864). W. E. Newton (com. from L. P. R. and L. R. de Massy), Manufacture of baryta and strontian.

1,426 (1864). F. H. Warlich, Manufacture of artificial fuel and coke.

338 (1864). W. C. Stobart, Improvements in coke ovens.

346 (1864). P. Spence, Manufacture of sulpho-cyanide of ammonium and other sulpho-cyanides.

372 (1864). W. Drake, Manufacture of iron.

497 (1864). F. Weil, Coating metals with one or several other metals, and oxidising the surface of these latter.

399 (1864). F. C. P. Hoffman, Machines for washing and crushing ores.

1,564 (1864). G. Haseltine (com. from L. G. Marshall), Apparatus for smelting and reducing ores and metals.

SPECIFICATIONS PUBLISHED, AND PRICES.

From July 23rd to Aug. 27th.

*** Specifications will be forwarded by post on receipt of price and postage at Her Majesty's Patent Office, 25, Southampton Buildings, London, W.C.—The amount of postage may be estimated from the price, as follows:—Where the price does not exceed 1*s.* 6*d.*, postage will be 1*d.*; above 1*s.* 6*d.*, and not exceeding 3*s.* 4*d.*, it will be 2*d.*; above 3*s.* 4*d.*, and not exceeding 6*s.* 4*d.*, it will be 4*d.*—Sums exceeding 5*s.* must be remitted by P. O. O., on Holborn Office, payable to *Bennet Woodcroft.*

3,066 (1863). W. and S. Firth and J. Sturgeon, Cutting and boring coal and stone; 1*s.* 4*d.*

3,093 (1863). T. Harrison, Puddling iron and steel; 10*d.*

3,107 (1863). T. V. Morgan, Treating and purifying plumbago for crucibles; 10*d.*

3,131 (1863). E. Solvay, Manufacture of carbonate of soda; 10*d.*
3,152 (1863). J. Wright, Manufacture of superphosphate of lime; 4*d.*
3,160 (1863). W. H. Thornthwaite, Manufacture of chromate of potash; 4*d.*
3,213 (1863). W. H. Tooth, Manufacture of iron and steel; 5*s.* 10*d.*
3,232 (1863). J. Shanks, Manufacture of caustic soda and potash; 4*d.*
3,233 (1863). D. Adamson, Manufacture of steel and iron; 10*d.*
3,265 (1863). W. R. Bowditch, Lighting mines; 4*d.*
3,296 (1863). T. B. Cochrane (Earl Dundonald), Producing hydrocarbon and other oils; 4*d.*
4 (1864). E. B. Wilson, Furnaces; 4*d.*
16 (1864). W. Balk, Furnaces for smelting, &c.; 10*d.*
30 (1864). J. J. Hays, Manufacture of peat charcoal; 1*s.*
31 (1864). J. Williams and G. Bedson, Puddling furnaces; 10*d.*

Current Review of Mining, Quarrying, and Metallurgy.

CORNWALL, DEVON, AND WEST SOMERSET.

The stagnation of all mining in Cornwall still continues unabated, nor does there appear to be any immediate prospect of a change for the better. In copper ores, it will be seen from our Metallic Ore Markets, there has been a continuous decline from the sale of Aug. 4th to that of the 25th. The tin standard remains the same as last month, for although it advanced 2*l.* on the 6th, it was put down again 2*l.* on the 24th.

The question of the sale of tin ore still continues to give rise to a good deal of discussion: we shall refer more fully to this subject next month.

The quarterly sittings of the Stannaries' Court, which commenced on August 17th, included no case of any particular importance or general interest, except an application made to inspect the books of *Condurrow* mine. The application was made on behalf of Mr. Arthur E. P. Willyams, a junior partner in the Miners' Bank of Truro and Camborne, and was not seriously opposed by the purser, Mr. Reginald Grylls, although some lengthened affidavits were gone into, the object of which was to show that Mr. Willyams' application was not made in good faith in the interest of the mine, but for the purpose of annoyance, in consequence of the banking account of the mine having been removed from the Miners' Bank. The Vice-Warden seems to some extent to have fallen in with this view, inasmuch as he made no order for costs. An appeal of some importance from the Vice-Warden was heard by the Lords Justices during the month, arising out of the matter of *Old Wheal Neptune*. The question involved was the right of the court to remove a liquidator appointed by the shareholders, in a voluntary winding-up under the inspection of the court. The Lords Justices decided that the court had the power of removing a liquidator so appointed.

There have been but few alterations in mines during the month, among which we may note the following:—At *Prosper United* the lode in the 80, west of Louisa's shaft, is disordered by a crossing; the lode in the 70, west of Hand's shaft, is 3′ wide; the lode in the 60 west will yield 2½ tons per fm. *Tolvadden* mine has improved for tin, a productive tin lode having been discovered near the boundary.

At *Wheal Seton* the bottom of the mine has fallen off a little. At

West Seton the lode in the 110 west is worth 2½ tons; in the 100 west, 9 tons; and the lode in the new shaft, 7 fms. below the 90, 10 tons of good ore, worth 75*l.* per fm. The other parts of the mine are also looking well. At *Wheal Basset* the ends on Williams' lode are producing 4½ tons of copper ore per fm. At *North Basset* the north lode in the 20 west is 18′ wide, worth 18*l.* per fm. for copper. At *Wheal Uny*, one of the East Carn Brea lodes is expected to be intersected in the 58 cross-cut, near the boundary, in a few fathoms more driving. At *West Frances* the stamping power is to be doubled; the mine is said to be looking well. At *Dolcoath* the bottom of the mine, east of the engine shaft, has improved; lode 8′ wide worth 30*l.* per fm. The value of the ends has fallen off a little. At *East Carn Brea*, on the new south lode, the winze from the 26 to the rise from the 50 has been communicated, which has produced for the 24 fms. 4 tons per fm., worth 7*l.* per ton. The mine is also reported to be looking very well on the whole. *Clifford Amalgamated*, which is by far the richest copper mine in Cornwall, is estimated to be turning out 200 tons per fm. The mine is now down to the 230 fm. level. A lode has been discovered in the 30, worth 10 tons per fm.

The bottom levels at *Wheal Grenville* are reported to be looking better, the winze sinking below the 100 being said to be worth from 60*l.* to 70*l.* per fm. The ends in the aggregate are worth 71*l.* per fm. At *East Grenville*, in the 65, a course of ore has been driven through 20 fms. long, worth 6*l.* per fm: the ends are stated to be poor. At *Great Wheal Busy* the lode in back of the 140 is worth 17*l.* per fm.; the lode in bottom of the 130, 40*l.*; the 130 west, 10*l.*; the stope east, 25*l.* per fm. At *Boscawen* the lode in the sump-winze is worth 35*l.* per fm.; the lode west of shaft, 25*l.*; and the winze below the 50 fm. level, 10*l.* per fathom. There is considerable discussion as to the merits of *Hallenbeagle* mine, arising from the contradictory reports of Captain Pope and Captain Charles Thomas; but there seems to be no doubt that, as we stated last month, there is a good course of ore in the mine.

At *Cargoll* Michell's engine-shaft is worth 45*l.* per fm. The 100 south is worth 1½ tons per fm., the back standing almost entire; the 110 north is also worth 35*l.* per fm., and driving for 4*l.*; the 100 north has been passing through a rich shoot of lead, and the East Wheal Rose lode has also been cut, which is of a very kindly character.

Among transactions at mine meetings may be noticed:—at *Wheal Basset* meeting (on Aug. 2nd) the banking account was transferred from Messrs. Tweedy & Co. to the West Cornwall Bank at Redruth. Much ill-feeling was expressed at the detention, by Captain William Richard's executors, from some cause publicly unexplained, of the books and documents belonging to the mine, which were demanded some time ago; and it was resolved that another demand be made before taking legal steps for their recovery. At *West Chiverton* meeting (on Aug. 3rd) the banking account was transferred from Messrs. Tweedy & Co. to the new Liskeard Bank—Messrs. Clymo, Hawke, & Co. At *West Frances* meeting (on Aug. 10th) there was a stormy discussion between the shareholders and the agents as to supplies. At *Wheal Vyvyan* meeting (on Aug. 20th) it was resolved to stop the mine. Mr. Benjamin Matthews has been appointed purser of *South Seton*.

The two undertakings announced during the month are:—The *Perran Wheal Maria* Mine, in the parish of Perranzabuloe, which is about to be worked by a cost-book company in 3,000 shares of 2*l.* each; and the *Devon Great Maria Consolidated* Mining Company, limited, with a capital of 50,000*l.*, in 2,000 shares of 25*l.* each, the object of which is to work some property near Devon Great Consols.

WALES AND THE BORDERS.

SOUTH WALES.—The scarcity of water during the last few weeks has seriously affected the iron trade, many of the works having been almost at a stand-still. Heavy showers of rain have fallen at various times but not sufficient to keep the works in continued activity. There has, however, been no lack of orders, and prices are somewhat firmer.

It is stated that the Aberdare Iron Company have purchased the freehold of *Abernant* and *Llwdcoed*.

An explosion of fire-damp occurred on Aug. 19th at the No. 9 pit, the property of the Aberdare Iron Company, by which four men were injured.

There has been a considerable amount of activity in the coal trade, particularly in steam-coal. The Continental States continue to be large customers, especially France, Spain, and Italy, and a considerable quantity is also sent to Danish and German ports. In house-coal a good business has been done, the Lantwit and Rhondda Valley collieries being in active employ.

During the month of July 105,830 tons of coal, and 90 tons of coke were exported from *Cardiff* in 283 vessels, against 113,018 tons in the previous month, and 138,704 tons in the corresponding month of last year. The shipments coastwise reached 70,722 tons as compared with 68,000 tons in June, and 82,608 tons in July, 1863. This large decrease in both the foreign and coasting coal trade is attributed mainly to the scarcity of tonnage, and at the commencement of the month there was also a slight dulness in the demand. There were exported from *Newport* 17,675 tons of coal in 63 ships, against 12,645 tons in the previous month, and 16,224 tons in the corresponding period of last year. Coastwise, the shipments were 52,422 tons. The exports of coal from *Swansea* reached 35,133 tons against 41,604 tons in the corresponding month of last year, and from *Llanelly* 26,679 tons against 29,329 tons in July, 1863.

The imports into Swansea include:—Iron ore from Santander, Bilboa, and Cherbourg; zinc ore from St. Malo; copper ore from St. Iago de Cuba, Hondeklip Bay, Cobiga, Caldera; copper regulus from Caldera; and lead and tin ores from Havre.

The *Aberaman Iron Works* Company (limited), with a capital of 500,000*l.* in shares of 50*l.* each, has been formed for the purpose of purchasing the well-known Aberaman Iron Works and Colliery, the property of Mr. Crawshay Bailey. Statements were at one time current that while the price to be paid to Mr. Bailey is 250,000*l.*, the shareholders are to pay 400,000*l.* It appears, however, that the company is to pay 350,000*l.*, the purchase not being direct from Mr. Bailey but from a third party, who stipulated for the property some time back, and who now requires these terms.

GLOUCESTERSHIRE AND SOMERSETSHIRE.—The imports from Bristol include:—280 tons of pyrites, and 486 tons of sulphur ore from Arklow; 85 barrels of sulphur and 78 boxes of lead ore from Liverpool; 410 tons of pig-iron from Glasgow and Belfast; 350 slabs of tin and 15 casks of barytes from Rotterdam; 5 tons of silver-lead ore from Truro; and 55 tons of lead ore from Newquay. During the month of July only 200 tons of coal were exported from Bristol as against 1,610 tons in June. The exports of iron were 1,131 tons as against 1,466 tons in the preceding month.

SHROPSHIRE.—The *Central Snailbeach* Mining Company (limited) propose to increase their capital from 10,000*l.* to 40,000*l.*, the company having an offer to increase their sett, and having determined to deepen

the mine. We have known this sett for some years, and think highly of it; with good management it ought to make a mine worthy of its name.

NORTH WALES.—The prospectus has been issued of the *Pant Du and Waenlas Mining* Company, with a capital of 30,000*l.* in 6,000 shares of 5*l.* each, for the purpose of purchasing and working the Pant Du and Waenlas lead mines in Denbighshire.

The last report of the *Minera* Mining company gives some interesting statistics of the growth of this successful concern from its commencement twelve years ago; during which period 41,811 tons of lead ore, and 9,050 tons of blende, have been sold, of the aggregate value of 613,506*l.* As showing the gradual progress of the concern, we find that while the returns during 1852 (the first year of working), only reached 1,230*l.*; in 1855 they were 17,981*l.*; in 1856, 36,588*l.*; in 1858, 47,982*l.*; in 1860, 64,825*l.*; in 1863, 93,101*l.*; while last year they reached 103,293*l.* Out of this aggregate value of 613,506*l.* there has been expended—in working costs 307,903, in payment of royalties 53,446*l.*, to promoters for leases 7,500*l.*—leaving a balance of profit of 289,894*l.*; of which 280,596*l.* has been distributed in dividends, leaving a reserve balance of 9,300*l.*, invested in stock. The dividends during the last year, ending June 30th, have been 33*l.* 5*s.* per 1,800th share, making a total of 59,850*l.* The annual working costs have increased, from 12,128*l.* in 1855, 19,907*l.* in 1858, 24,111*l.* in 1860, 31,962*l.* in 1863, to 33,699*l.* during last year. The proportion of the working expenses credited in the capital account of the company (which was closed in 1853) for levels, shafts, buildings, machinery, and railway, up to that date, was 45,298*l.*; out of which the plant is valued at 12,250*l.*

The report of the engineer, Mr. John Taylor, of the firm of Messrs. John Taylor and Sons, is highly favourable, as notwithstanding the large quantity of lead ore returned during the past year there has been but a small diminution in the reserves of ore; the maintenance of which is due, however, more to the multiplicity of productive points of moderate yield than to the opening up of any very rich places. Some exceedingly rich workings are in progress in the 100 and 120 yards levels; for from one bargain six men have, for many months, raised from 120 to 130 tons of lead ore per month at 12*s.* 6*d.* per ton. This mine is a remarkable instance of the success of energetic working; for under an inferior management it is possible that the result might have been as disastrous as it is now successful.

The demand for slate continues far in advance of the supply, and where good slate is produced there are 12 months' orders on the books at the present time. A number of companies have recently been promoted with the view of commencing operations on new ground, but, with very few exceptions, complete failure has been the result. In one instance no less than 30,000*l.* was expended, and the deluded shareholders found in the end that there was no vein of slate whatever in the property, and, in fact, they might as well have thrown their money into the sea.

MIDLAND COUNTIES, SOUTH LANCASHIRE, AND SOUTH YORKSHIRE.

STAFFORDSHIRE AND WARWICKSHIRE.—Trade in this district has been in a most unsettled state during the whole of the past month, in consequence of the extensive strike of the colliers for an advance of wages, and all the furnaces and forges west of Dudley have had to be kept on by coal obtained from the east of Dudley. Most of the

ironworks were, however, idle in the early part of the month, in consequence of the Wolverhampton races. On Aug. 17th 1,400 men in the employ of Earl Granville as colliers and ironstone miners turned out in resistance to a notice of a reduction of 6*d.* per day in their wages, but returned to work very shortly.

Towards the close of the month reports stated that the ironmasters in the district immediately affected by the strike have been suffering great inconvenience from the determination of the men not to accept the reduction. There are instances in which some of the mills stopped from want of fuel. The proprietors have been trying to obtain their supplies not only from remote parts of this district, but also from South Wales and elsewhere, but even these sources were insufficient to meet their requirements. The miners at the same time display much vacillation. They have gone in in several instances, but at several collieries so soon as they return to work they serve their employers with a fortnight's notice for a return to the rise from which they have been dropped.

The demand for iron has considerably improved, especially for sheets and plates. The weather having been too hot for the puddlers to do more than about three-fourths work, is causing the execution of orders to be delayed, and from Canada and the Baltic, where the frost early closes the internal navigation, their completion is anxiously pressed. There are rather more orders for India, and the continental demand, except from France, is good.

The *Midland Iron* Company is to be converted into a joint-stock company with limited liability.

DERBYSHIRE.—Both the iron and coal trades continue in a satisfactory state. There has been a good demand for coal, and prices seem likely to rise. The *Sheepbridge Coal and Ironworks*, situated at Dunston and Barlow, near Chesterfield, the property of Messrs. Hankey and Fowler, have been transferred to a joint-stock company, with a capital of 500,000*l.*

SOUTH YORKSHIRE.—The activity in the iron trade still continues, and the coal trade has improved since the men have resumed work, though it has not regained the position it held before the commencement of the strike.

SOUTH LANCASHIRE.—There is nothing fresh to notice in the coal and iron trades of this district, which continue in much the same position as stated in our last.

NORTHERN COUNTIES, NORTH LANCASHIRE, AND NORTH YORKSHIRE.

NORTHUMBERLAND AND DURHAM.—The iron trade of this district still maintains a good position. It is stated that the establishment of an Exchange at Middlesborough has had a very satisfactory effect upon the market, and has caused an advance of quite 2*s.* per ton. Eight or nine new furnaces are expected to be put into blast during the next six months, the joint weekly production of which is estimated as likely to be nearly 3,000 tons.

In the *Cleveland* district trade keeps tolerably steady though quiet. There are 27 furnaces in course of erection, and the rolling mills and foundries are well supplied with orders. The last report from *Middlesborough* states that the export trade is inactive, chiefly on account of the reduction of the French duty on pig-iron of 4*s.* per ton on the 1st of October, which makes the French consumers hold back in the meantime. A good trade with Prussia is expected in the autumn.

Messrs. Whitwell and Co. are it is said about to erect malleable ironworks, immediately adjoining their furnaces at South Stockton. The following was the state of the blast-furnaces of the district on August 5th :—

Place and Owners.	In.	Out.	Total.
Eston—Bolckow and Vaughan	9	—	9
,, Clay Lane Company	6	—	6
,, South Bank Company	3	—	3
Cargo Fleet—Jones, Dunning, and Co.	2	—	2
,, Cochrane and Co.	4	—	4
,, Gilkes, Wilson, Pease, and Co. ...	5	—	5
Middlesbrough—Bolckow and Vaughan	4	—	4
,, Hopkins and Co.	2	—	2
Port Clarence—Bell Brothers	6	—	6
Norton—Warner, Lucas, and Barrett	3	—	3
Stockton—Holdsworth and Co.	3	—	3
Ferryhill—J. Morrison	3	—	3
Newport—B. Samuelson	2	1	3
Thornaby—W. Whitwell and Co.	3	—	3
Darlington—South Durham Company ...	3	—	3
Witton Park—Bolckow and Vaughan	4	—	4
Stanhope—Weardale Iron Company ...	1	—	1
Towlaw—Weardale Iron Company	5	—	5
Consett—Derwent Iron Company	6	12	18
Total	74	13	87

The *Shotley Iron* Company, whose works are near Consett, have made up their books, which show a profit on paid-up capital of over 100 per cent. The Rosedale mines in Cleveland and the Ferryhill Ironworks have become the property of a limited liability company called the *Rosedale and Ferryhill Iron* Company (limited). Another important purchase of iron and coal works has just been completed, through Messrs. Chadwick, Adamson, M'Kenna, and Co., of London and Manchester, the agreement having been signed for the transfer to a company to be called *Bolckow, Vaughan, & Co.*, limited, of the works and property of Messrs. Bolckow and Vaughan, at Middlesborough, Wilton Park, Eston, White Lee, Woodifield, Sheldon, West Auckland, and other places in Yorkshire and Durham, at which establishments more than 9,000 persons are employed. The whole of the properties and stock are taken by valuation, and the estimated total purchase-money will be about 1,500,000*l.* The capital of the new company has been fixed at 2,500,000*l.*, in 25,000 shares of 100*l.* each. The vendors take 400,000*l.* of the capital, in 8,000 shares, with 50*l.* paid up. A deposit of 20,000*l.* has been paid, and a farther sum of 230,000*l.* will be provided in January next, when possession will be given to the new company. The remainder of the capital will be subscribed privately, three-fourths of it being already taken.

There has been a brisk demand for steam-coal, which has caused an advance of 6*d.* per ton, and at a meeting held on Aug. 20th, it was decided to raise the price of house-coal also 6*d.* per ton.

A dispute has arisen at *Newsham* colliery, and the men employed there have come out on strike. They in the first instance demanded an advance of one-halfpenny per ton and a certain amount of remuneration for the "rammel." A deputation from the men waited upon the

masters, who declined to give the advance asked for, as the average daily earnings of the men was 5*s*. 9*d*.; but they offered to reduce the price paid for the best work and add it to that which did not pay so well. This, however, did not meet the wishes of the men, who gave in their notices; and they have now been nearly three weeks on strike. They have subsequently offered to give up the demand for a halfpenny per ton if the masters would give them some consideration for the "rammel." The masters state that the matter is now out of their hands, having been taken up by the committee of the Coalowners' Association.

The exports from the Tyne include:—148,952 tons of coal, 9,442 tons of coke, and 26,627 cwts. of iron.

SCOTLAND.

Coal has shown an upward tendency in prices, but otherwise trade continues the same as during the last few months. The coal pit lately opened at *Trodigal*, near Cambeltown, promises to be successful. Some samples of the coal raised have been exhibited, and it is said to be equal to that imported from the Ayr coast.

The iron trade has been in a very satisfactory condition during the past month, makers not having been so generally busy for some time past, and unusually good shipments have been made, particularly to Canada. The various works have been well supplied with orders, but some difficulty has been experienced from a scarcity of hands.

On Aug. 15th a meeting of miners' delegates was held at Glasgow, when it was agreed that the delegates should urge upon their respective districts the necessity of collecting funds, to be expended in the promotion of measures for obtaining an advance of wages.

The agitation among the miners in the Glasgow and Wishaw districts for an advance of wages has at length reached *Kilmarnock*, and a meeting of those employed in the Kilmarnock, Hurlford, and Galston districts has been held near Hurlford, to consider the best mode of obtaining this advance. It was resolved to make a demand on their employers for an additional 6*d*. per day, and that if this were refused to stand out for 1*s*. The motion was carried unanimously.

It is thought that iron will be got in the hill of Beneigen, on the Speyside estate of *Arndilly*. Several engineers have visited it in the course of the season, and it is reported that Mr. Macdowal Grant, the proprietor, is about to lease the mines to a Glasgow company. It is thought that besides iron, manganese and other ores will be found in abundance.

CONTINENT OF EUROPE AND MEDITERRANEAN COUNTRIES.

FRANCE.—The iron trade has been exceedingly dull, but it is hoped that the firmness of neighbouring markets will react on French metallurgical industry, which at present has scarcely participated in the movement of activity commenced in England, and continued with vigour by the Belgian ironmasters. At *St. Dizier* transactions have been almost *nil*. A general inactivity has prevailed, and operations at the works have been slackened by the scarcity of water. Pig-iron has been quoted nominally at 4*l*. 12*s*. to 4*l*. 14*s*. per ton. Manufactured iron has been quoted at 8*l*. 16*s*. to 9*l*. The advices from the *Moselle* continue satisfactory; all the works are in full activity, and although orders have somewhat fallen off, there is still a fair amount coming in.

The *Châtillon and Commentry Iron* Company has just held its annual general meeting. The report referred to the difficulties introduced by the new commercial *régime* involved by the treaties of commerce concluded with France and Belgium. The first obstacle to be overcome by the company arose from the insufficiency of its resources; it being necessary to adapt the plant to the general position of a manufacture, the conditions of which were radically transformed, and to direct this manufacture to specialities which offered less favourable chances of success. Charcoal iron not being able to struggle cheaply with the coke iron introduced into the market, it became necessary to abandon competition on the ground of foreign products, and to take refuge in the manufacture of products which recommended themselves by other qualities than those of cheapness exclusively. This at first had the effect of overburthening the company with a statutory debt of more than 480,000*l.*; and in 1862, the final result for the whole of the workings was a loss of about 46,000*l.* But, in 1863, instead of a loss, a profit of about 20,000*l.* was realised, exclusive of a nearly equal sum applied to the redemption of the debt, so that the previous deficit was reduced to about 21,200*l.* This result was due in part to the improved position of the collieries, which yielded coal in great variety and at a less high rate.

BELGIUM.—Advices from *Charleroi* state that transactions with England, which were very slack at the beginning of the month, have been latterly a little more active. Encouraging reports have also been received from *Liége* as to the state of the iron trade in that district. The *Montigny-sur-Sambre* Company has declared a dividend of 3,600*l.*

The coal trade remains very inactive, and as the navigation of the Sambre is now suspended, it will be some time before there will be any definite change in the aspect of affairs.

WESTPHALIA.—We give some statistics as to the production of the *Siegen* group of works during 1863. The number of blast-furnaces lighted was 17, and their production amounted to 28,000 tons of pig-iron, and 7,500 tons of steely pig, of the total value of 154,000*l.* The puddling furnaces and rolling mills turned out 16,000 tons of iron in bars, plates, &c., of the total value of 150,000*l.*

A valuable discovery of coal is reported at *Essen*. Some time ago a shaft was sunk to the east of the town in search of coal; for a long time the result has been very doubtful, but on the 3rd of August, a seam 41″ thick was cut through, and in sinking further after passing through 43″ of slate clay, a second bed of 43″ of the purest coal was discovered.

SAXONY.—The *Pirna Magnetic Iron and Copper* Company, with a capital of 160,000*l.*, in shares of 10*l.* each, has issued its prospectus, which states that the object of the undertaking is to work a mine in Saxony, in the Altenberg mining district, called "Mutter Gottes Vereinigt Feld sammt Gott mit uns Eisen und Kupfererz Bergbau," which extends over more than 500 acres, and is to be purchased by the company for 85,000*l.*, half in paid-up shares, and half in cash by instalments. The entire property is held in perpetuity, subject to the Saxon Government tax, equal to 1-20th royalty. The mine has been and is still worked for copper ore, but it is intended to make the necessary arrangements for manufacturing pig-iron, steel, and copper.

MORAVIA.—The Landgrave von Fürstenberg, the Archbishop of Olmütz, having dismissed from his service 120 miners who had seceded

from the Roman Catholic Church and embraced the Protestant faith, they are now working in the mines of Baron Anselm Rothschild, who possesses very extensive iron works at Wittkowitz.

PRUSSIA.—From a statement made at a meeting of Berlin merchants, it was shown that the use of cast-zinc for architectural and other purposes was fast gaining ground in Germany, and that that country is already able to compete in the market with France and Belgium.

Although the consumption of steel and iron has greatly increased, the imports have considerably diminished during the first quarter of the present year, compared with the same period in 1863—an evidence of the great extension of the iron industry of the Zollverein Union. The imports during the first quarter of last year reached 25,000 tons of pig-iron, while during the same period of the present year they only amounted to 11,962 tons, or 52% less. In wrought iron the proportions between the same period of the two years is as 590 tons to 346 tons, or 41% less. The import of rails was 34 tons against 52 tons in the corresponding quarter of last year. The only increase is in very large castings, amounting to 845 tons.

The government of Baden has proposed to the other States bordering on the Rhine to reduce the tariff on the transport of pig-iron down the river, from the highest rate of toll to the next lower rate, so as to preserve the traffic for the Rhine, which is now being partially directed through France.

NORTH AMERICA.

LAKE SUPERIOR REGION.—No discoveries of any importance have been made in this district since our last. The various mines have been kept steadily working, and prospects in general are reported to be looking very favourable.

UNITED (ATLANTIC) STATES.—The *Pennsylvania Coal* Company has declared a dividend of 7½ per cent. The production of the oil wells of the *Venango Region* has decreased to the extent of from 1,200 to 1,500 barrels per day. Discoveries of oil wells are reported to have been made in *Yates* County.

CALIFORNIA AND BORDER TERRITORIES.—On July 4th and two following days, Wells, Fargo, and Co. shipped from *Virginia* 5,289 lbs. of bullion, worth $127,959·83. Furnaces are in course of erection for properly treating the *Reese River* ores, and as soon as a sufficient number of these are in operation, a large increase may be expected in the shipments of bullion. The charge for working the ores when properly roasted will be $150 per ton. Rich gold diggings have, it is said, been discovered near *Grizzly Hill*, Nevada County.

A coal seam has been discovered in *Napa* county, and a company has been formed for the purpose of working it.

A discovery is reported in *Esmeralda* county of a material called fire-stone, which is said to be equal to fire-brick.

SOUTH AMERICA.

BRAZIL.—The *St. John del Rey* Mining Company have received the following advices:—Produce for June, 20,319 oitavas; cost, 10,759*l.*; loss, 2,654*l.* Produce, first ten days of July, 4,513 oitavas; yield, 2,743 oitavas per ton. Smaller supply of stone.

From *Don Pedro North Del Rey* Captain Treloar reports that the gold returns for June amounted to 1,529½ oitavas, or 261½ oitavas more than that of the preceding month, and that the mine, on the whole, is looking better.

GRANADA.—At the meeting of the *Mariquita and New Granada* Mining Company, on July 29th, it was stated that the quantity of rough ore raised at Santa Ana Mine between 31st March, 1863, and 31st March, 1864, had been 2,325 tons, and that the quantity of dressed ore treated had been 620 tons, the quantity of fine silver produced being 112,474 oz. against 93,636 oz. of fine silver obtained from 508 tons of dressed ore in the previous year.

CHILI.—A prospectus has been issued of the *Chilian Mining and Trading* Company, with a capital of 340,000*l.*, in shares of 20*l.* The object is to purchase two copper mines in Chili for 295,000*l.*, one-fourth of which is to be paid in shares.

AUSTRALASIA.

VICTORIA.—At *Port Phillip's Colonial* the quantity of quartz crushed during May was 2,776 tons, yielding 762 oz. 15 dwt. of gold, or an average of 5 dwt. 11 gr. per ton. The receipts for the same period were 1,426*l.*, and the payments 977*l.*, leaving a profit of 449*l.* The low return is partly accounted for by the best stope then going in the mine having been suspended working, to enable the Clunes Company to put in some additional timber. Men have been set to work on all the latter portions of the mine, and the stamps are now kept at work almost entirely day and night. The return for the month of June is estimated at 4,100 tons of quartz crushed, yielding 1,106 oz. of gold.

SOUTH AUSTRALIA.—The directors of the Australian Companies have received advices up to June 27th. At *Kapunda* the quantity of ores raised in April was 322 tons, 19 per cent. average produce equal to 61 tons of pure copper, exclusive of 125 tons of sulphur ores for flux. The quantity raised in May was estimated at about 330 tons wet weight and of good percentage.

From *English and Australian* advices state that there were five furnaces and one refinery at work at the Port Adelaide works, and on the 4th of July the furnaces would be lighted at the Burra works for the winter operations.

Captain Anthony reports that *Yudanamutana* is looking well.

At *Scottish Australian* the arrangement for working the West Cadia Mine by this Company having expired on the 15th of May last, the workings there and at Cadiangullong have since that period been carried on jointly by the proprietors of the mines and this company under the new arrangement. At Lambton Colliery matters are reported to be going on satisfactorily, 350 tons per day being raised. The price has gone up 1*s.* per ton.

From *Worthing* there was nothing new to report. The principal operations were the getting ready the new furnace and dressing machinery.

WESTERN AUSTRALIA.—At *Fortune* the stope in the 40 fathom north-east end is producing 2½ tons of yellow copper ore per fm., and that in the south-west 3 tons per fm., all from 18 to 20 per cent. produce. The stope in the 30 fm. level south-west is producing 3 tons of lead and 1 ton of copper ore per fm.

Record of the Mining and Metal Markets.

METALLIC-ORE MARKETS.

TIN.—The standards for black tin remain as quoted in our last; for although an advance of 2*l.* was made on the 6th, a decline of 2*l.* was announced on the 24th, leaving quotations:—

Superior Fine	...	£101	..... Superior Common	...	£97
Second Fine	...	£99	..... Second Common	...	£96

COPPER ORE.—At the six copper ore sales included in our present number—four Cornish sales (on the 4th, 11th, 18th, and 25th) and two Swansea sales (on the 16th and 30th)—the number of tons of ore, number of tons of fine copper, average produce per cent., average cost per ton of ore, average cost per ton of copper in ore, average returning charges for the total number of tons of ore required to produce a ton of fine copper, and the average total cost of a ton of fine copper to the smelter, at each sale, and for the whole month (including the total amount of money realised), have been as follows, which show rather a heavy decline between the Cornish sales of the 4th and 11th, after which prices were nearly stationary until the last Swansea sale, when the British ores had an advance, and when the low rate realised by the Colonial and Foreign ores was probably due to the abnormal richness of the Cape ores.

Date.	Tons of Ore.	Tons of Fine Copper.	Average Produce.	Average Cost per Ton of Ore.	Average Cost per Ton of Copper in Ore.	Average returning Charges.	Average Cost of Fine Copper.
Aug. 4	3,084	197 0 0	6¾	£5 6 6	£83 7 6	£17 16 6	£101 4 0
„ 11	2,180	153 5 0	7	5 13 3	80 11 7	17 2 3	97 13 10
„ 16	*1,491	158 9 0	10⅝	8 14 2	81 19 0	14 14 0	96 13 1
	†179	32 3 0¾	17 1/4	14 15 9	82 6 4	12 15 7	95 1 11
„ 18	4,934	280 11 0	5 1/16	4 9 1	78 7 6	18 15 10	97 3 4
„ 25	3,704	231 3 0	6¼	4 18 0	78 10 4	18 0 2	96 10 7
„ 30	*280	33 10 1	11 5/16	10 5 0½	85 13 1	14 3 6½	99 16 8
	†885	154 6 2¾	17 7/16	14 11 2½	83 10 0	12 17 4¼	96 7 4
	16,737	1,240 8 0¼	7 1/16	5 19 10	80 17 3‡	16 14 11	97 12 2
	Totals for the Month.			Averages for the Month.			
	Amount of Money	£100,302 10 6					

* British and Irish Ores. † Colonial and Foreign Ores. ‡ Equal to 16*s.* 2*d.* per Unit of Copper.

LEAD.—The prices of lead ores show on the whole a reduction of about 10*s.* per ton.

COAL MARKETS.

LONDON.—Mr. J. R. Scott, Registrar of the London Coal Exchange, has favoured us with the following statistics of this market for the month of August. Detailed particulars will be found in Mr. Scott's published returns, issued monthly. The total quantity of seaborne coal, culm, and cinders imported into London during August was 262,055 tons, against 271,463 tons during the corresponding month of last year,—showing a *decrease* of 9,408 tons. The following are the particulars of the 262,055 tons imported during August:—

Newcastle ...	103,404	tons in	212	ships	Scotland ...	1,967	tons in 16 ships
Seaham ...	10,343	„	46	„	Wales ...	11,151	„ 28 „
Sunderland .	78,758	„	187	„	Yorkshire ...	1,302	„ 16 „
Middlesbro' .	6,246	„	25	„	Small ...	3,763	„ 7 „
Hartlepool ..	43,985	„	162	„	Cinders ...	612	„ 8 „
Blyth ...	524	„	2	„			

The quantity of coal imported by railways and canals during the month of August was 181,852 tons, against 142,820 tons in the corresponding month of last year, showing an *increase* of 39,032 tons. The following are the particulars of the 181,852 tons imported during August:—

	Tons.		Tons.
London and North Western ...	82,094	London Chatham and Dover...	205
Great Northern	54,777	Tilbury and Southend... ...	30
Great Western... ...	20,232	South Western...	1,558
Great Eastern	12,603	Grand Junction Canal ...	610
Midland	9,743		

On August 1st, the new ships arrived were 28; an active business was done in house-coal; Hetton Wallsend, 19*s.*; Haswell Wallsend, 18*s.* 6*d.*; South Hetton Wallsend, 18*s.* 9*d.*; Eden Main, 17*s.*; Bute's Tanfield, 13*s.* On the 3rd, new ships 73; market steady. On the 25th, new ships 21; a moderate demand in the market. On the 8th, new ships 57; market continued steady. On the 10th, new ships 64; a fair business was done. On the 12th, new ships 43; market firm. On the 15th, new ships 38; business steady. On the 17th, new ships 42; house-coal in fair demand; Hartley's scarce at an advance of 6*d.* On the 19th, new ships 46; market very quiet. On the 22nd, new ships 49; the tone of the market depressed. On the 24th, new ships 66; there was an active inquiry for all descriptions. On the 26th, new ships 32; a steady demand. On the 29th, new ships 49; house-coal in more active demand. On the 31st, new ships 17; market firm. Hetton Wallsend, 19*s.*; Haswell Wallsend, 18*s.* 9*d.*; Tees Wallsend, 18*s.* 3*d.*; Hasting's Hartley, 18*s.*

LIVERPOOL.—From Messrs. J. and T. Platt's Coal Circular we find that the quantity of coal, cannel, coke, and patent fuel shipped from Liverpool to foreign and colonial ports during the month of July was 51,686 tons, against 51,024 tons during the corresponding month of last year—showing an *increase* of 662 tons. The exports coastwise during July were 11,183 tons, against 9,625 tons during the same month last year—showing an *increase* of 1,558 tons. The total exports coastwise from January to July were 83,325 tons, against 51,424 tons during the corresponding period of 1863—showing an *increase* of 31,901 tons.

NEW YORK, *August 20th.*—The demand for house-coal has been very brisk, and prices have been firm, with a large business doing for the East and local trade. In Foreign little business has been done for want of supplies.

BOSTON, *August 18th.*—English coal has been quiet and prices nominally $23-$25 per ton. Sydney and Pictou have been firm at $12-$13.

PHILADELPHIA, *August 19th.*—Schuylkill, $12-$13 per ton; Lehigh, $11-$12; Diamond Red Ash, $12-$12·50; Locust Mountain, $11·50-$12.

CONTRACTS.—The Admiralty require the supply of 1,000 tons of South Wales coal, for the ships at Haulbowline. The Admiralty

also require 250 to 300 tons of South Wales coal at Bathurst, River Gambia. The Crown Agents for the Colonies require the supply of 2,000 tons of Newcastle and South Wales coal, to be delivered at Port Louis, in the Island of Mauritius.

STOCK AND SHARE MARKETS.

LONDON.—The month of August has shown a slight recovery in this market from the excessive dulness which has characterised it for the last three months. During the first fortnight there was scarcely any relief from the stagnation noticed in our last, for transactions were few, and prices downwards. On the 17th business rallied for a few days, but again relapsed until the 29th, when the market showed a little animation, which however has scarcely been maintained to the close of the month.

The *Mining Financial Association*, which we noticed in our last, issued, in the *Mining Journal* of the 13th, a list of prices of shares in mines which they were prepared to receive in lieu of cash as payment upon allotment. A more extraordinary list was probably never issued, for it included an amount of unsaleable rubbish dear at a gift, the calls to maintain which could not be supported without ruin by the Bank of England. An amended list has been promised, but had not appeared up to the time of our going to press.

Two new iron companies have been brought out during August—One, by Messrs. Chadwick, Adamson, McKenna, & Co. (the promoters of the Ebbw Vale Company), for the purchase of the mines and works of Messrs. Bolckow & Vaughan in Yorkshire and Durham, with a capital of 2,500,000*l.* in 25,000 shares of 100*l.* each. The title of the company will be *Bolckow, Vaughan, and Company, Limited*, Mr. Bolckow acting as chairman, and Mr. Vaughan as deputy-chairman. The other company is the *Aberaman Iron Works Company* (Limited), promoted by the Financial Corporation, with a capital of 500,000*l.*, in 10,000 shares of 50*l.* each. Its object is to purchase the iron works of that name, lately the property of Mr. Crawshay Bailey, M.P., for 350,000*l.* The price paid to Mr. Bailey is 250,000*l.*, so the intermediate purchasers net 100,000*l.* profit.

The *Kilcrohane and Gurtnakilla* Slate and Slab Company, with a capital of 40,000*l.*, in 10,000 shares of 4*l.* each, has also been introduced on the market. Its object is to purchase works and quarries of that name in the western part of Cork.

The following have been the principal alterations in prices:—

Declined.

East Basset	£2	Wheal Uny	£ ¼
Wheal Buller	7	Wheal Seton	10
East Lovell	7	Stray Park	2
Great Wheal Fortune ...	2½	Condurrow	20
Wheal Margaret	8	Clifford Amalgamated ...	1½
Sithney Metal	1	Hallenbeagle	1
Wheal Kitty (Lelant) ...	2	Wheal Rose	5
Herodsfoot	2	Great Wheal Busy	¼
Chiverton Moor	1⅜	Great North Downs	⅛
Wentworth Consols	1	Prosper United	1⅛
East Caradon	1½	Pendeen	1¼
West Caradon	6½	Great Laxey	1
Marke Valley	¼	Rhymney Iron	1
Gonamena	¼	Peel River Land and Mineral.	2
East Carn Brea	¼	Nova Scotia Gold and Land...	⅝
Wheal Union	1⅛		

Advanced.

East Grenville	£1 7/8	North Treskerby	£ 7/8
West Frances	4	West Seton	5
West Chiverton	2 1/4	North Roskear	6
Wheal Chiverton	1 1/2	Tincroft	1 3/4
Wheal Trelawny	1 1/2	St. John Del Rey	1 7/8
South Caradon	35	United Mexican	3 5/8
East Russell	3/4	Fortuna	1/4
Devon Great Consols	15		

East Grenville shares have again attracted the principal attention. They opened at 5⅝*l.*-5¾*l.*, and after almost daily fluctuations close at 7½*l.*-7¾*l.* *Wheal Grenville* shares have not varied much, and close about as they opened, at 7¼*l.*-7½*l.* *East Basset* shares opened on Aug. 1st at 66*l.*-68*l.* ex. div.; on the 4th they went up to 69*l.*-71*l.*, but again declined immediately to 66*l.*-68*l.* On the 9th they again went up to 68*l.*-70*l.*, at which price they remained until the 15th, when they commenced declining with a few fluctuations, closing flat at 64*l.*-66*l.* *Wheal Buller* shares have fallen from our last quotation of 25*l.*-27*l.* to 18*l.*-20*l.* *West Frances* improved to 32½*l.*-35*l.* *South Basset* shares, which have not been quoted since February, 5½*l.*-6½*l.* *Wheal Basset*, 92½*l.*-95*l.* *North Basset*, 2*l.*-2½*l.* *West Basset*, 8½*l.*-9*l.* *South Grenville*, 9*s.* to 11*s.*

There has been a heavy decline in *East Lovell* shares which opened on the 1st at 15*l.*-16*l.*, and after receding steadily all through the month close at 8½*l.*-9*l.* *Great Wheal Vor* shares, although reported daily in the market, have varied but little, and close at 27½*l.*-28½*l.* *Providence* shares opened better at 40*l.*-42*l.*, but have since fallen to last month's prices of 39*l.*-41*l.* *Great Wheal Fortune* shares have been weak, and close at 10*l.*-11*l.* There has been a fall in *Wheal Kitty* (Lelant) shares to 9*l.*-10*l.* *Wheal Margaret* shares have declined since our last quotation in July number to 7*l.*-8*l.* *Grylls Wheal Florence*, 2½*l.*-3¼*l.* *Sithney Wheal Metal* shares, which were last quoted in June, 2*l.*-2½*l.* *New Wendron Consols*, 3¼*l.*-3¾*l.*

In lead mines *West Chiverton* shares have slightly recovered, and are quoted a little better at 62½*l.*-67½*l.* *Wheal Chiverton* shares also show an improvement from 7¾*l.*-8¾*l.* to 8½*l.*-9½*l.* *Wheal Trelawny* shares have slightly rallied again to 20*l.*-21*l.* *Herodsfoot* shares, last quoted in June, 37*l.*-39*l.* *Chiverton Moor* shares have also declined from their last quotation in May to 3*l.*-3½*l.* *Wentworth Consols* shares are lower at 10*l.*-11*l.* *Wheal Mary Ann*, 14*l.*-15*l.* *North Chiverton*, 1⅜*l.*-2⅛*l.*

East Caradon shares have again declined. They opened on the 1st at 28¾*l.*-29¼*l.*, and close at their lowest quotation of the month at 27¼*l.*-27¾*l.* *West Caradon* shares show a heavy fall from our last prices, being now quoted 9¾*l.*-10¼*l.* *South Caradon* shares have advanced to 495*l.*-505*l.* *Glasgow Caradon*, 3*l.*-3¼*l.* *Marke Valley*, 4½*l.*-4¾*l.* *Gonamena*, 3¼*l.*-3¾*l.*

East Russell shares still show an upward tendency closing at 5⅛*l.*-5⅜*l.* *Devon Great Consols*, 585*l.*-595*l.* *New Martha*, 1*l.*-1⅛*l.* *Wheal Crebor*, 2*l.*-2½*l.* *Drakewalls*, 1¼*l.*-1½*l.* *Hingston Down*, 4*l.*-4½*l.* *North Devon*, 1½*l.*-2*l.*

East Carn Brea shares have been daily reported in the market, but do not show much alteration; they opened at 8⅝*l.*-8¾*l.*, and close at 8*l.*-8½*l.* *North Treskerby* shares show an improvement, having gone up to 2⅞*l.*-3⅛*l.* *Wheal Union* shares have declined from their last quotation in March to 1½*l.*-1⅝*l.* *Wheal Uny*, 4¾*l.*-5*l.* *Great South Tolgus*, 2½*l.*-2¾*l.*

A fair amount of business has been done in *Wheal Seton* shares, which at one time were as low as 200*l.*-205*l.*, but close at 210*l.*-215*l.* *West Seton* shares have advanced to 220*l.*-230*l.* *North Roskear* shares have also advanced from 17*l.*-19*l.* to 23*l.*-25*l.* *North Crofty* shares are a little better at 4*l.*-4¼*l.*

Tincroft shares have improved gradually throughout the month from their opening price of 17¼*l.*-17¾*l.* to their closing one of 19*l.*-19½*l.* *Stray Park* shares have fallen to 27*l.*-28*l.*; and *Cook's Kitchen* to 15½*l.*-16½*l.* *South Condurrow* shares are better at 1½*l.*-1½*l.* *Condurrow* shares have heavily receded to 50*l.*-60*l.* *Camborne Vean*, 2⅝*l.*-2⅝*l.* *Carn Camborne*, 1⅝*l.*-1½*l.*

Clifford Amalgamated shares opened at 32*l.*-33*l.*, and on the 6th were quoted 10*s.* higher, but they have since receded to 30½*l.*-31½*l.* *Hallenbeagle* shares are lower at 3⅝*l.*-3¾*l.* *Wheal Rose* shares have again declined, closing at 35*l.*-37*l.* *Nangiles*, 27*l.*-28*l.* *St. Day United*, 1⅝*l.*-1¾*l.* *Great Wheal Busy*, 2*l.*-2¼*l.* *Great North Downs*, 4¼*l.*-5*l.*

Prosper United shares, which were last quoted in June at 4½*l.*-5*l.* have declined to 3½*l.*-3½*l.* *Pendeen* shares also show a reduction to 1¾*l.*-2*l.* *Wheal Unity*, 5*s.*-10*s* *New Rosewarne*, 8*l.*-10*l.* *East Rosewarne*, 3½*l.*-3⅝*l.*

Among Welsh and Isle of Man mines and undertakings *Great Laxey* shares have gone down to 15*l.*-16*l.* *Rhymney Iron* shares are also lower at 29*l.*-30*l.* ex. div. *Rhymney Iron New*, 9*l.* ex. div. *Ebbw Vale*, par-5*s.* pm.

In foreign and colonial shares there is still great dulness. *Cobre* shares have declined to 30¼*l.* *St. John Del Rey* shares opened better on the 1st at 40½*l.*-39½*l.*-41*l.*, but have again declined, and closed at 36*l.* *United Mexican* shares have greatly improved, and are now quoted at 5¾*l.*-6*l.* *Peel River Land and Mineral* shares are lower at 38*l.* *Fortuna*, 3⅛*l.*-4*l.* *Cape Copper*, 10½*l.* *Worthing*, 17*s.* 6*d.* *Yudanamutana*, 2⅜*l.* *Don Pedro North Del Rey*, 10*s.* *Santa Barbara*, 10*s.* *Port Phillip*, 1*l.* *English and Australian*, 1½-1⅝*l.* ex div. *Kapunda*, 1¼*l.* *Montes Aureos*, 2¼*l.* *Scottish Australian*, 7*s.* 6*d.*-10*s.* *Alamillos*, 15*s.* *Anglo-Mexican Mint*, 19¼*l.* *Nova Scotia Gold and Land*, 1⅝*l.*-1⅞*l.* *Nova Scotia Gold and Land* (New), 1½*l.* *Nerbudda Coal and Iron*, 5½*l.* *General*, 22½*l.* *Anglo-Brazlian Gold*, 5*s.* *Dun Mountain Copper*, 7*s.* 6*d.*

Among new undertakings the shares in the *Aberaman Iron Works* were quoted on the 18th at 1½*l.*-1⅝*l.* pm., on the 20th at ½*l.*-1*l.* pm., on the 22nd at par-1*l.* pm., and close at ½*l.*-1*l.* pm. *Humber Iron Works*, 2½*l.*-1½*l.* dis. *Kilcrohane and Gurtnakilla Slate and Slab*, ¾*l.*-1*l.* pm.

CORNWALL.—The mining share market here continues very dull. *East Grenville* shares seem to have commanded most attention, and have been pretty freely dealt in. They have advanced about 1*l.* to 6¾*l.*, at which they have been steady. *Wheal Seton* shares have been firm at 212*l.*-215*l.* *Nangiles* shares went up at one time to 27½*l.*, but closed lower at 26*l.*-26½*l.* *Hallenbeagle* shares steady at 3¾*l.*-4*l.*

BIRMINGHAM.—*Muntz Metal*, 1⅝*l.*-1¼*l.* dis. *Ebbw Vale*, 5*s.* dis. —5*s.* pm.

LIVERPOOL.—*Santa Barbara*, 5*s.* dis.

MANCHESTER.—*Stavely Coal and Iron* shares have advanced from 20*l.* pm., at which they opened, to 29*l.* pm. *Montes Aureos*, 2¼*l.*

DUBLIN.—During the early part of August there was some movement in the Irish mining share market in consequence of the

demand for *Mining Company of Ireland* shares, which advanced from our last quotation of 28*l.*-28½*l.*, to 30*l.*, but have since become depressed, and close at 27*l.*-27½*l.* *Wicklow Copper* shares have also been in request, and close at 14⅛*l.*-14¼*l.* *Connorree* shares have been steady at 1*l.* *General Mining Company of Ireland*, 4⅜*l.* *Carysfort* 1*l.*

NEW YORK, *August 20th.*—Although few stocks have been pressed on the market, the transactions have been limited, as much from the scarcity of really first class stocks, as from the absence in the country of many prominent operators.

COAL STOCKS.—These stocks have been in good demand, with limited offerings. The *Hampshire and Baltimore* company have declared a semi-annual dividend of 5%. The following stocks have been principally quoted:—*American*, $85-$87; *Ashburton*, $20-$22; *Cumberland*, $60-$61½; *Central*, $61-$62½; *Consolidated*, $120-$123; *Consolidation*, $70-$75; *Delaware and Hudson*, $209½-$210; *Lehigh and Susquehanna*, $14-$15; *Pennsylvania*, $212-$214.

COPPER STOCKS.—These stocks have been in better demand, especially those of Lake Superior, the accounts from this latter district continuing very satisfactory. The *Merrimac* company has made a call of $1 per share, and the *Aztec* company of 50 cents per share. The following have been the quotations:—*Aztec*, $6-$7; *Bedford*, $1-$1½; *Boston*, $4½-$5½; *Canada*, $3½-$4½; *Clifton*, $½-$1; *Copper Falls*, $35-$36; *Dacotah*, $5-$5½; *Derby*, $1-$2; *Evergreen Bluff*, $19-$20; *Flint Steel*, $12-$14; *Frue*, $2-$3; *Grand Portage*, $40; *Hamilton*, $6-$7; *Hilton*, $5-$6; *Hudson*, $1-$2; *Huntingdon*, $2-$2½; *Huron*, $35-$36; *Indiana*, $7-$9; *Isle Royal*, $21½-$22; *Keweenaw*, $6; *Knowlton*, $8-$10; *Lafayette*, $2-$2½; *Manhattan*, $8-$9; *Mendota*, $3-$4½; *Merrimac*, $4¾-$5; *Minesota*, $35-$37; *National*, $32-$33; *New York*, $2-$2½; *Norwich*, $6-$7; *Ogima*, $5-$6; *Ontonagon*, $3-$4; *Phœnix*, $28-$29; *Providence*, $1¼-$2; *Quincy*, $94-$95; *Reliance*, $2-$2½; *Rockland*, $12½-$13½; *Superior*, $9½-$10.

GOLD STOCKS.—These have been steadily passing into the hands of investors, who, it is said, intend to hold their stocks from the market. The principal quotations have been as follows:—*Benton*, $1¼-$1½; *Briggs*, $140-$150; *Corydon*, $3½-$4; *Gregory*, $35-$40; *Gunnell*, $4-$4½; *Hope*, $8-$8½; *Isaac's Harbour*, $¾-$1; *Mammoth*, $9½-$10½; *Mariposa*, $44½-$45; *Montana*, $1-$1½; *New York and Nova Scotia*, $⅜-$½; *Quartz Hill*, $11-$11½; *Rocky Mountain*, $9-$10.

IRON STOCKS.—Quotations have been as follows:—*Copake*, $8-$8½; *French Creek*, $1-$1¼; *Teal Lake*, $6½-$7.

LEAD STOCKS.—These have been in good demand, particularly *Wallkill* and *Clute*, at the following quotations:—*Bucks County*, $⅝-$¾; *Clute*, $1¼-$1½; *Erie*, $20; *Macomb*, $4-$5; *Placentia Bay*, $1-$2; *Sussex*, $⅝-$⅞; *Wallkill*, $3-$3½. [*** Quotations in Legal Tender Notes: American Gold, 257¼%.]

SAN FRANCISCO, *July 16th.*—The improvement in the mining share market noticed in our last was of very short duration, and the market has been very much depressed for the last three weeks, all the stocks on the list having, with very few exceptions, declined more or less. Speculative inquiry appears nearly to have ceased, and the transactions in leading shares have been mainly on account of foreign capitalists.

The principal feature in the market has been the heavy decline in *Gould and Curry* shares. They opened at $3,100, but receded in a week to $1,640. They recovered a little again, and closed at $1,725. A dividend of $50 per foot was declared. A large number of *Ophir* shares have changed hands, and prices have advanced to $725. *Chollar*

shares have gone back to $425. *Savage* shares have declined to $950. *Potosi* shares have advanced to $1,000. *North American*, $70. *Belcher*, $950. *Yellow Jacket*, $700. *Golden Age and Empire*, $14. *Burning Moscow*, $15. *Melones* $7½. *Lady Bryan*, $8¾. *Baltimore American*, $40. *Uncle Sam*, $405. *Antelope*, $25. *Wide West*, $7½. *Utah*, $21. [*** Quotations in Gold: Legal Tender Notes 38%.]

METAL MARKETS.

LONDON.—We have been furnished with the following report by *Messrs. Von Dadelszen and North.* The metal market has during August been extremely dull; and consumers, exporters, and speculators have all curtailed their operations as much as possible. The continued high rate of interest presses heavily upon all classes. It is a fact, perhaps worth recording, that during August three of the largest ironmasters in the kingdom have transferred their businesses to joint-stock companies.

IRON.—Welsh bars have been in good demand, and prices well maintained. Rails are also fully supported. In Staffordshire iron, the demand is about equal to the supply, which is lessened by the hot weather. Scotch pig-iron has been extremely stagnant, and prices have varied but 6*d.* per ton; closing at cash, 59*s.* 9*d.* to 60*s.* open. The Middlesboro' market is daily increasing in importance, owing to the establishment of the warrant system. The present price of warrants, three months open, is—sellers, 53*s.* 6*d.*; buyers, 53*s.* Swedish iron and steel continue very inactive.

COPPER.—Although no alteration has been made in the official price of English, the market has been very dull, and sales made both from first and second hands at 4*l.* under. There has been rather a better feeling in the market the last few days. Foreign has been quite neglected, and we have been almost without transactions. Burra and Kapunda are nominally quoted 100*l.*; Walleroo, 98*l.*; Chili, 86*l.*

TIN.—The month which has just closed has been of the greatest importance to all those interested in this article. The arrivals both of Banca and Straits have been enormous, and amount to the unprecedented figure of 38,070 slabs, equal to 1,365 tons, thereby increasing our already heavy stock to 3,500 tons. Such a quantity of tin has never been collected together in this port, and at present there does not appear any prospect of its being lessened, on the contrary, there are indications that the steady accumulation will continue, as there are about 1,100 tons of Straits still afloat for England, and some considerable purchases of Banca have still to be brought over from Holland during the next four months. It is not to be wondered at under these circumstances, that many holders should have lost confidence in the article, and the market shown great heaviness, coupled with a decline in price. Throughout the month the Dutch houses have been continually making offers, and pressing their surplus Banca for sale in this market. Although several heavy sales were effected, it did not give them the relief they anticipated, and at one time offers even as low as f. 60 could not be placed. Holders of Straits followed the same course, and gradually giving way in their demands finally accepted 100*l.* This seems to have been a rebounding point, as the market since has recovered considerably. Thus our anticipations for months past have been realised, and we can only repeat our so often expressed opinion that, unless shipments from Penang and Singapore entirely cease for some time, and consumption of foreign tin rapidly and materially increases, further disappointments will be in store to

present holders. With reference to the importation of Straits, we have every reason to believe that, stimulated by the high prices ruling for the last few years, the production has materially increased, and as it is impossible for China, India, and Japan, to absorb more than a part of the production, a considerable portion must find its way to this market, especially in the absence of the usual American demand. As for an increase in our home consumption, we have to look principally at the state of our Tin Plate trade, the condition of which, at the present moment, is most unfavourable, and, as long as the American War lasts, it is not likely to show much improvement. At present the Tin Plate makers are only supplying themselves very sparingly, as, in consequence of the want of water, their works are almost stopped, and their requirements are freely supplied by the English smelters, who, notwithstanding the comparative low price of foreign tin, have for some time past been vieing with each other in securing a market for their makes, which, by the way, would seem to disprove an assertion we have seen, that the production of English tin has materially fallen off during the first eight months of this year. It has been very truly remarked that when we look at the heavy stock, we should also look at the low prices now ruling, but we think that if a comparative statement were made, it would be found that prices are by no means lower than are warranted by the excessive supply. Till the lowness of the price begins to tell upon the article itself, by its being applied to other purposes for which, though suited, its dearness has hitherto excluded its being used; till we see these enormous stocks beginning to move off, and the tide setting the other way, we cannot say that prices are cheap, or recommend purchases as an investment. Every four months puts 3*l.* a ton on to the price of tin, and those who have waited for the good day, which is so long in coming, would perhaps have done better to have accepted their original loss, and then go in again at lower prices on the eve of brighter times.

The quantity of tin now afloat for England is 1,099 tons, against 637 tons last year, and to the Continent of Europe 66 tons. There has been no change in the official price of English, and the demand has been fully equal to the supply. Straits stood at the commencement of the month at 105*l.* 10*s.*, closing at 103*l.* cash. Banca had declined from 106*l.* to 101*l.*, but has since recovered to 103*l.* 3*s.*

The arrivals of tin in London during August were 38,070 slabs; of which 17,120 slabs were Straits, and 20,950 slabs Banca from Holland. The present stock of tin in Warehouse is estimated at 3,500 tons.

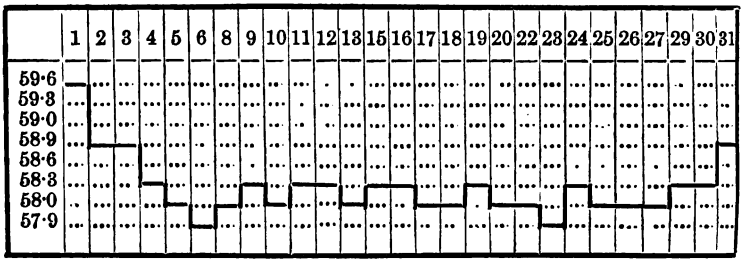
Tin Plates.—Owing to the continued drought, the make has been still further curtailed. Stocks everywhere must necessarily have been much reduced, and an improved demand would probably cause a decided advance in prices.

Lead, in the early part of the month, was extremely depressed, and almost unsaleable; but a better demand has sprung up, and prices show a reaction of about 5*s.* per ton from the lowest point.

Spelter.—A very large business was done, and prices show an improvement of fully 20*s.* per ton. During the last week, owing to bad accounts from Hamburg, prices are a shade lower, and purchases can be made at 24*l.* 15*s.* for Spot and September, 24*l.* 17*s.* 6*d.* for October, and 25*l.* for W. H. Hull. Spelter has sold at 24*l.* 15*s.*, and W. H. 25*l.* We estimate the present stock of Spelter in London at 10,964 tons, exclusive of Brewer's Quay, supposed to be about 800 tons, against 12,091 tons last month.

Quicksilver is in full supply, and obtainable at 8*l.* for immediate delivery.

GLASGOW.—IRON.—The Scotch pig-iron market has been very quiet all through the month of August, and prices show unusually trifling fluctuations. The market opened at by far the highest price of the month, 59*s.* 6*d.*, an advance of 1*s.* 1*d.* on the closing price of July; but it immediately relapsed, for on the 2nd it was reported very flat at 58*s.* 9*d.*, and continued to decline daily until the 6th, when prices had fallen as low as 57*s.* 9*d.* On the 8th there was a slight rally to 58*s.* buyers, after which the market remained quiet but firm, prices showing scarcely any fluctuation until the 31st, when there was a much firmer tone, and prices advanced to 58*s.* 9*d.* buyers. No. 1, G. M. B. 58*s.* 6*d.*; No. 3, 57*s.* 9*d.* The following diagram shows, at a glance, the daily fluctuations of this market, the highest cash price of the day being given:—



COLOGNE, *August 29th.*—The metal market during the past month has undergone but little change, in some cases, however, prices have fallen.

IRON.—Charcoal-iron and Spiegeleisen have been quoted at (per ctr.) 1½-1¾ thlr.; coke pig-iron, 1⅛-1¼ thlr.; grey coke pig-iron for casting 1$\frac{6}{10}$-1½ thlr.; Scotch pig No. 1. 1$\frac{6}{10}$-1$\frac{7}{10}$ thlr.; bar-iron, 3-3¼ thlr.

STEEL.—Cast-steel was quoted at 22-24 thlr.; Puddled-steel, 10 thlr.; refined steel, 14 thlr.

COPPER.—Paschkoff has been quoted at 40 thlr.; American 39 thlr.; English 34 thlr.; first quality rosette copper 33 thlr.; second quality 31 thlr.

TIN.—Banca has been quoted at 37½ thlr.; English in blocks 38 thlr.

SPELTER.—This metal has been quoted at 7⅞-8 thlr.

LEAD.—This article has been quoted at somewhat lower rates. Refined lead 6½-6¾ thlr. Unrefined lead 6¼-6½ thlr.

ANTIMONY.—Regulus of antimony has been quoted at 16-16½ thlr.

BERLIN, *August 27th.*—The metal market has been firm and prices show an advance.

IRON.—Scotch pig, No. 1 (per ctr.), 51-52 sgr.; English 48 sgr.; Silesian charcoal pig iron, 52 sgr.; coke pig iron, 48 sgr. delivered here; Silesian rolled bar iron, 3½-4 thlrs.; hammered bar iron, 4½ thlrs.

TIN.—No business has been done in this metal. English has been quoted at 36½ thlrs.; Banca 37½-38 thlrs.

SPELTER.—In consequence of the activity in the London and Hamburg markets the prices of spelter have remained firm, although very little business has been transacted.

COPPER.—Although but small quantities were in the market, prices have remained firm. Paschkoff has been quoted at 43 thlr.; Demidoff 35½ thlr.; English, tough cake, 32⅜ thlr.; best selected, 32½ thlr.; Swedish 34-35½ thlr.; American, 35½-36 thlr.

LEAD.—Small parcels of lead, have been sold at good prices, but the

large parcels are being kept back by the holders for an advance. Tarnowitzer has been quoted at 6¾ thlr.; Saxon 6⅞ thlr.

BRESLAU, *August 27th.*—The market for Spelter has been very active, 20,000 ctr. have been turned over, and prices have advanced to 7 thlr. 20 sgr.

STETTIN, *August 26th.*—In consequence of the increased charges for freight and assurance the prices remain high.

IRON.—Scotch pig 50-52 sgr.; English 46-47 sgr.

SPELTER.—This article has been firmer at 8¼-8 5/12 thlr.

LEAD.—Spanish 8½ thlr.; German 6¾-6⅞ thlr.

TIN.—Banca 37½-38½ thlr.

COPPER.—Copper has been quoted at from 33-42½ thlr.

HAMBURG, *August 25th.*—The metal market has been dull and little business transacted.

IRON.—Scotch pig, 2¾ mk.; English bar-iron, 6 mk.; Staffordshire descriptions, 7 mk.; Swedish in bars, 8¼-8½ mk.

STEEL.—Swedish in boxes of 1 ctr. each have been quoted at 11½ mk.; Milan No. 00 in boxes of 138 lbs. weight ¼ sq. in., 18 mk.; No. 0 5/16 sq. in., 17 mk.

COPPER.—The price of Copper in the market remains firm. Drontheimer Röraas was quoted at 67½ mk.; Avesta, 65 mk.; Demidoff, 75 mk.; Lake Superior, 72 mk.; Copper sheeting for ships, 73 mk.

YELLOW METAL has been quoted at 56 mk.

NICKEL in cubes (per lb.), 3⅛ mk. (per lb.).

COPPER NICKEL 1½ mk.

QUICKSILVER was quoted at 28 sch.

SPELTER.—The market opened very active, with higher prices, but it has since become quieter. Silesian Spelter in slabs, 16⅜ mk. delivered here; common Silesian Spelter 19 mk.; Vieille Montagne 19½ mk.

TIN.—Banca 11¾ sch.; English 11¾; ditto in bars 12 sch.

LEAD.—There being only a small quantity in the market, the full price was paid. German pig lead has been quoted at 13½-13¾ mk. English pig lead 14¾ mk. English rolled 15¼ mk.

AMSTERDAM. *August 27th.*—TIN has been inquired for. Banca was quoted 60¾-61 fl.

LEAD has been quiet.

ROTTERDAM, *August 27th.* TIN.—Banca sold 1,000 blocks at 61¼ fl., and 1,500 blocks at 61 fl.

LEAD.—Spanish, 11½ fl.; Eschweiler and Stolberger, 12 fl.; other German sorts, 11⅞ fl.

COPPER.—Drontheimer, 63 fl.; North American, 62-65 fl. according to quality.

NEW YORK, *August 20th.* IRON.—Pig-iron has been dull, but without any particular change in prices. Sales of Scotch pig at $75 to $80 according to brand, American rail $75. Bar, hoop, and sheets have been very quiet and prices merely nominal.

COPPER.—The market for American ingot has been unsettled and prices heavy. New sheathing has been firm at 72 cents.

BOSTON, *August 18th.* IRON.—The market for pig-iron has been steady, and there have been sales of Scotch, at $80 per ton. In American pig the sales have been in small lots $72·50-$75 per ton, cash.

VALPARAISO, *July 17th.* COPPER.—Bar copper (per quintal 100 lbs.), $18·43.

HONGKONG, *July 12th.* LEAD.—Common, $6-$6·10; best, $6·20-$6·40; sales 1,057 pigs.

IRON.—Nailrod, $2·95-$3·20; hoop, $3-$3·75; bar, $2·80-$3. No sales.

CALCUTTA, *July 22nd.*—The metal market has been very quiet, but as stocks are generally moderate prices have continued steady.

IRON.—In this metal a fair amount of business has been done.

TIN has been neglected.

SPELTER has been in demand at better prices.

ANALYSIS OF BOARD OF TRADE RETURNS.

THE "Accounts relating to Trade and Navigation of the United Kingdom, for the month ended 31st July, and seven months ended 31st July, 1864," give, on analysis, the following results as to the Imports and Exports of Mining, Mineral, and Metallurgical products, which show:—

On the EXPORTS for the month the large *decrease* of nearly 300,000*l.*, which is principally on the articles of railroad iron, tin plates, copper (unwrought), pig lead, and tin (unwrought). In railroad iron, the falling off has been mainly in exports to the United States (35,000*l.*), Spain (25,000*l.*), Prussia (13,000*l.*), Sweden (10,000*l.*), and Russia (10,000*l.*). In tin plates most of the falling off is in exports to the United States (43,000*l.*). In copper (unwrought) there has been a falling off in exports to France of 57,000*l.* In pig lead the falling off is nearly equally divided between Russia and China (each 12,000*l.*). In tin (unwrought) the falling off is divided pretty equally between Russia and France (each 10,000*l.*).

IMPORTS.—The quantities and relative increase and decrease of the imports of metals, metallic ores, and mineral products, for the month and seven months ended 31st July, have been as follows:—

	Month ended 31st July.			Seven Months ended 31st July.		
	1863.	1864.	Increase (+) or Decrease (−)	1863.	1864.	Increase (+) or Decrease (−)
Brimstone.....cwt.	38,049	46,055	+ 8,006	384,034	447,581	+ 63,547
Copper Ore .....tons	4,859	3,964	− 895	45,607	35,902	− 9,705
Copper Regulus ..... „	72	2,655	+ 2,583	11,751	16,069	+ 4,318
Copper, unwrought and part wrought .....cwt.	46,880	42,260	− 4,620	148,820	237,280	+ 88,460
Iron, in Bars, unwrought, tons	5,526	5,154	− 372	16,123	17,610	+ 1,487
Steel, unwrought ..... „	245	515	+ 270	1,013	3,481	+ 2,468
Lead, Pig and Sheet ..... „	3,142	2,049	− 1,093	14,225	16,521	+ 2,296
Spelter or Zinc ..... „	1,842	2,444	+ 602	14,584	17,466	+ 2,882
Tin, in Blocks, Ingots, Bars, or Slabs.....cwt.	2,685	624	− 2,061	22,024	28,095	+ 6,071
Silver Ore .....value in £	2,650	14,225	+ 11,575	176,981	141,928	− 35,053
Petroleum.....tuns	3,259	2,241	− 1,018	24,320	7,893	− 16,427
Pyrites .....tons	21,931	10,257	− 11,674	108,657	84,258	− 24,399
Quicksilver ..... lbs.	48,978	503,687	+ 454,709	450,605	2,546,614	+ 2,096,009

EXPORTS.—The quantities, declared value, and relative increase and decrease of the exports of metals, minerals, and metallurgical articles of British and Irish produce and manufactures, for the month and seven months ended 31st July, have been as follows:—

	QUANTITIES.				DECLARED VALUE.					
	Month ended 31st July.		Seven Months ended 31st July.		Month ended 31st July.			Seven Months ended 31st July.		
	1863.	1864.	1863.	1864.	1863.	1864.	Increase (+) or Decrease (−)	1863.	1864.	Increase (+) or Decrease (−)
					£	£	£	£	£	£
Alkali: Soda ..... cwt.	199,293	166,755	1,240,079	1,270,450	80,749	70,604	− 10,145	514,688	530,518	+ 15,830
Coal, Cinders, and Culm ..... tons	791,126	761,496	4,671,967	4,898,056	347,473	355,733	+ 8,260	2,073,356	2,295,377	+ 222,021
Iron, Pig and Puddled ..... „	43,398	43,630	273,466	281,351	116,681	133,090	+ 16,409	744,349	861,752	+ 117,403
Iron, Bar, Angle, Bolt, and Rod. „	27,233	21,932	184,616	175,522	209,459	208,442	− 1,017	1,378,850	1,634,462	+ 255,612
Iron, Railroad, of all sorts..... „	65,487	33,039	265,162	256,536	430,994	286,881	− 144,113	1,851,150	2,080,819	+ 229,669
Iron, Cast ..... „	7,933	6,038	51,469	39,852	62,986	54,631	− 8,355	427,288	379,829	− 47,459
Iron Hoops, Sheets, and Boiler Plates ... ... „	13,338	9,749	75,460	73,532	159,577	142,332	− 17,245	863,775	1,046,793	+ 183,018
Iron, wrought, of all sorts ... „	9,363	9,279	60,398	62,065	186,031	194,122	+ 8,091	1,151,082	1,294,031	+ 142,949
Iron, old, for re-manufacture ... „	583	1,323	10,839	5,642	2,166	7,964	+ 5,798	40,899	27,535	− 13,364
Iron Steel, unwrought ... ... „	2,614	2,212	15,648	18,148	85,465	75,603	− 9,862	507,374	590,065	+ 82,691
Copper, unwrought, in Ingots, Cakes, or Slabs ..... cwt.	24,280	14,597	162,501	65,029	112,424	71,266	− 41,158	742,903	329,851	− 413,052
Copper, wrought or partly wrought, Bars, Rods, Bottoms, Pans, Plates, Sheets, and Nails; and mixed or Yellow Metal for Sheathing . „	56,980	54,124	319,877	277,728	258,866	258,123	− 743	1,457,211	1,401,290	− 55,921
Copper, wrought, of other sorts . „	1,023	2,259	5,568	8,741	5,784	14,562	+ 8,778	33,944	56,082	+ 22,138
Brass of all sorts ... ... „	3,601	2,656	24,974	20,707	17,884	14,392	− 3,492	124,109	113,697	− 10,412
Lead, Pig, Rolled, Sheet, Piping, Tubing, and Lead Shot ..... tons	3,607	2,301	22,631	20,401	77,235	51,932	− 25,303	488,189	449,765	− 38,424
Lead Ore, Lead, Red, and White, and Litharge of Lead ..... „	608	597	3,774	3,838	15,126	15,252	+ 126	90,328	97,421	+ 7,093
Tin, unwrought ..... cwt.	10,239	6,867	46,757	51,529	59,804	36,103	− 23,701	274,842	282,277	+ 7,435
Tin Plates ..... „	122,229	73,812	667,337	685,673	144,539	94,192	− 50,347	780,600	870,295	+ 89,695
Zinc or Spelter, wrought or unwrought ..... „	11,589	6,295	51,599	68,341	10,883	7,733	− 3,150	50,747	72,764	+ 22,017
Salt ..... tons	57,723	55,623	367,709	360,431	28,623	26,163	− 2,460	170,955	170,001	− 954
				£	2,412,749	2,119,120	− 293,629	13,766,639	14,584,624	+ 817,985

LONDON PRICES CURRENT OF METALS.

From Messrs. JAMES and SHAKSPEARE'S, 10, Austin Friars, E.C., 1*st September*.

			Per Ton.		
IRON	Welch	Rails in Wales	£7 0 0	@	£7 5 0
		Bars "	7 0 0	"	7 5 0
		"	7 17 6	"	8 5 0
	Staffordshire	"	——	"	9 10 0
		Nail Rods	——	"	9 10 0
		Hoops	——	"	10 10 0
		Sheets	——	"	11 10 0
	Scotch	Pig (mixed Nos. warrants) in the Clyde	——	"	2 18 0
	Swedish Hammered	Iron ... Large sizes	——	"	12 10 0
		Iron ... Indian assortments	——	"	12 10 0
		Steel .. Faggot	——	"	16 10 0
		Steel .. In kegs (½ and ⅝ in.)	——	"	15 10 0
			Per Unit.		
COPPER		Ore	17*s.* 3*d.*	@	17*s.* 6*d.*
		Regulus	17*s.* 3*d.*	"	17*s.* 6*d.*
		Barilla	18*s.* 6*d.*	"	19*s.* 0*d.*
			Per Ton.		
		Chili Slab (for 96°/₀ pure Copper)	——	none	——
		Spanish Cake	——	@	£90 0 0
	Australian	Burra and P.C.C.	99 0 0	"	100 0 0
		Kapunda	102 0 0	"	103 0 0
		Wallaroo	99 0 0	"	100 0 0
		Cadia	99 0 0	"	100 0 0
	American	Baltimore / Lake Superior	——	none	——
	English	Tough Cake and Ingot and Tile	94 0 0	@	98 0 0
		Best selected Ingot	97 0 0	"	101 0 0
		Sheets, Sheathing and Rod	102 0 0	"	105 0 0
		Flat Bottoms	107 0 0	"	110 0 0
			Per lb.		
YELLOW METAL		Sheets (4 × 4 feet)	8*d.*	@	8½*d.*
		Sheathing and Rod	8½*d.*	"	9*d.*
			Per Cwt.		
TIN	English	Common Blocks and Ingots	——	@	104*s.*
		" Bars (in barrels)	——	"	105*s.*
		Refined	——	"	109*s.*
	Foreign	Straits, Fine	100*s.*	"	103*s.*
		" (with 3 months' prompt)	102*s.*	"	105*s.*
		Banca	100*s.*	"	103*s.*
			Per Box.		
TIN PLATES		Charcoal IC, best	29*s.* 0*d.*	@	30*s.* 0*d.*
		" IX "	35*s.* 0*d.*	"	36*s.* 0*d.*
		Coke IC "	23*s.* 0*d.*	"	26*s.* 0*d.*
		" IX "	29*s.* 0*d.*	"	32*s.* 0*d.*
			Per Ton.		
LEAD	English	Sheet	——	@	£21 5 0
		Pig—W.B.	——	"	22 10 0
		" Other good brands	£20 5 0	"	20 10 0
	Foreign	" (German and Spanish) soft	19 10 0	"	20 0 0
	English	Red	——	"	22 0 0
		Shot	——	"	23 15 0
		Dry White	——	"	26 10 0
SPELTER		(Silesian) in Cakes	24 15 0	"	25 0 0
ZINC		(Sheet) No. 9 and upwards	——	"	28 0 0
			Per Bottle.		
QUICKSILVER (in bottles containing 75 lbs. each)			8 0 0	@	8 5 0
			Per Ton.		
REGULUS OF ANTIMONY, French Star			——	@	36 0 0

Tabular Abstract of Mining Accounts for the Month.

Date of Account.	Name of Mine, and Number of Shares.	Balances. Debit. £ s. d.	Balances. Credit. £ s. d.	Calls. Per Share. £ s. d.	Calls. Total. £ s. d.	Dividends. Per Share. £ s. d.	Dividends. Total. £ s. d.
	CORNISH & DEVON MINES.						
uly 27	Wheal Sidney (4,096)	—	577 9 3	0 2 6	512 0 0	—	—
„ 28	Craddock Moor (1,055)	—	986 2 4	—	—	—	—
„ 28	Wheal Edward (4,096)	660 0 0	—	0 4 0	319 4 0	—	—
„ 28	Lady Bertha (6,000)	515 0 0	—	0 2 0	600 0 0	—	—
„ 28	Wendron Consols (1,024)	1,738 19 7	—	1 10 0	1,536 0 0	—	—
„ 30	Kitty (St. Agnes) (4,295)	—	2,565 0 0	—	—	0 5 0	1,073 0 0
„ 30	Nun's Cross (?)	—	28 5 5	0 15 0	?	—	—
Aug. 1	Clijah and Wentworth (787)	—	—	0 10 0	393 10 0	—	—
„ 1	Mount Carbis (2,000)	—	—	0 10 0	1,000 0 0	—	—
„ 2	South Basset (512)	429 0 0	—	—	—	—	—
„ 2	Wheal Basset (512)	—	1,796 6 7	—	—	1 10 0	768 0 0
„ 2	West Caradon (1,024)	—	745 9 5	2 0 0	2,048 0 0	—	—
„ 2	Penhalls (5,000)	1,605 2 3	—	0 3 0	750 0 0	—	—
„ 3	West Chiverton (3,000)	—	7,300 19 2	—	—	0 15 0	2,250 0 0
„ 3	Wheal Chiverton (3,000)	347 0 9	—	1 0 0	3,000 0 0	—	—
„ 3	Redmoor (10,156)	50 9 5	—	0 0 6	253 18 0	—	—
„ 3	East Margaret (1,024)	950 3 1	—	0 15 0	768 0 0	—	—
„ 4	Botelet (1,024)	102 1 9	—	0 10 0	512 0 0	—	—
„ 4	East Treskerby (1,024)	—	—	0 15 0	768 0 0	—	—
„ 4	South Seton (400)	—	—	2 10 0	1,000 0 0	—	—
„ 5	Pedn-an-drea (8,465)	—	—	0 4 6	1,900 0 0	—	—
„ 8	Dolcoath (358)	—	2,889 5 8	—	—	6 0 0	2,148 0 0
„ 8	Wheal Seton (396)	—	—	—	—	4 0 0	1,584 0 0
„ 9	North Treskerby (5,936)	—	571 6 3	—	—	—	—
„ 10	Frank Mills (5,000)	—	2,886 17 5	—	—	0 5 0	1,250 0 0
„ 10	West Frances (512)	1,352 17 3	—	2 0 0	1,024 0 0	—	—
„ 10	East Grenville (6,000)	584 16 0	—	0 2 0	600 0 0	—	—
„ 10	North Robert (6,144)	1,005 16 8	—	0 5 0	1,536 0 0	—	—
„ 10	Calvadnack (915)	726 16 1	—	1 0 0	915 0 0	—	—
„ 10	South Exmouth (5,000)	1,475 18 1	—	0 4 0	1,000 0 0	—	—
„ 10	Lanivet (3,000)	—	244 17 4	—	—	—	—
„ 10	North Frances (2,500)	—	—	0 5 0	625 0 0	—	—
„ 11	East Seton (5,610)	—	117 12 1	—	—	—	—
„ 11	North Crofty (5,610)	160 1 5	—	0 2 6	701 5 0	—	—
„ 11	North Grambler (1,366)	—	—	0 12 6	853 15 0	—	—
„ 15	New Rosewarne (1,024)	425 3 2	—	—	—	—	—
„ 15	South Crofty (937)	595 10 1	—	0 10 0	468 10 0	—	—
„ 16	West Seton (400)	—	2,378 19 5	—	—	4 0 0	1,600 0 0
„ 16	Boscaswell (1,248)	—	347 17 5	—	—	—	—
„ 17	Wheal Crebor (6,000)	—	254 18 7	0 1 6	450 0 0	—	—
„ 17	Botallack (200)	910 13 9	—	—	—	—	—
„ 17	Sithney Carnmeal (2,048)	1,438 13 8	—	0 15 0	1,536 0 0	—	—
„ 17	Wheal Rose (2,000)	1,393 0 0	—	—	—	—	—
„ 18	Great South Tolgus (6,000)	273 16 7	—	—	—	—	—
„ 18	Trelawny (1,040)	—	—	—	—	0 12 6	650 0 0
„ 18	Wheal Par (1,024)	437 15 0	—	0 8 0	409 12 0	—	—
„ 19	Wheal Unity (6,000)	—	—	0 3 0	900 0 0	—	—
„ 19	Wheal Owles (80)	—	1,558 2 9	—	—	—	—
„ 20	Wheal Vyvyan (1,024)	1,704 0 8	—	2 0 0	2,048 0 0	—	—
„ 22	Cargoll (916)	—	918 15 8	—	—	0 15 0	687 0 0
„ 22	Wheal Tremayne (2,044)	—	539 11 6	—	—	—	—
„ 22	East Bottle Hill (6,000)	113 14 7	—	0 1 0	300 0 0	—	—
„ 22	Wheal Damsel (6,144)	321 0 0	—	0 1 6	460 16 0	—	—
„ 22	Tresavean and Tretharrup (501)	—	—	1 0 0	501 0 0	—	—
„ 23	New Crow Hill (6,400)	83 13 1	—	0 1 0	320 0 0	—	—
„ 23	St. Ive's Wheal Allen (960)	569 3 5	—	0 12 0	576 0 0	—	—
„ 24	Clifford Amalgamated (2,900)	—	1,526 1 3	—	—	0 10 0	1,450 0 0
„ 24	North Basset (6,000)	316 15 4	—	0 2 6	750 0 0	—	—
„ 25	Hingston Down (6,000)	—	456 5 7	—	—	—	—
„ 25	East Carn Brea (6,000)	—	8 18 5	—	—	—	—
„ 26	South Carn Brea (6,000)	23 17 10	—	—	—	—	—
„ 26	Wheal Grenville (6,000)	498 7 3	—	0 2 0	600 0 0	—	—
	Wheal Curtis (1,000)	2,666 13 4	—	2 13 4	2,666 13 4	—	—
	WELSH & OTHER MINES.						
July 20	Vale of Towy (20,000)	727 6 9	—	—	—	—	—
„ 25	Alderley Edge (1,200)	—	490 16 4	—	—	—	—
Aug. 4	Prince of Wales (12,800)	—	4,386 7 9	—	—	—	—
„ 5	Lady Eleanor (?)	214 5 6	—	1 0 0	?	—	—
„ 5	South Kilmorey (96)	88 13 0	—	—	—	—	—
„ 5	Minera (1,800)	—	18,297 17 0	—	—	10 0 0	18,000 0 0
	FOREIGN MINES.						
Aug. 9	Montes Aureos (100,000)	—	22,372 5 8	—	—	—	—
„ 18	English and Australian (70,000)	—	—	—	—	0 2 0	7,000 0 0

Copper Ores.

Sampled July 20, and sold at Tyack's Hotel, Camborne, Aug. 4.

Mines.	Tons.	Purchasers.	Price.
Clifford Amalgamated	110	12	£3 10 6
	81	7	4 11 6
	78	3, 11	5 8 0
	76	12	2 7 6
	73	6	5 9 6
	70	3	10 16 6
	66	1, 3, 7	4 8 6
	65	9	4 4 0
	63	3	9 6 6
	57	3	9 4 0
	47	2	4 13 0
	26	1, 3, 7	4 10 6
	25	1	4 8 6
(Consols)	37	5	12 3 0
	31	2	10 17 0
Wheal Seton	87	10, 13	1 2 6
	82	10	4 15 6
(Pendarves)	114	7	6 8 0
	81	10	6 11 0
	74	8	4 12 6
	72	13	1 6 6
West Seton	90	2, 6	4 10 6
	75	2, 4, 6	7 8 6
	72	6	5 10 0
	66	6, 7	5 7 6
	65	7	10 1 0
	53	7	2 7 0
East Pool	75	8	0 10 0
	59	9	4 4 0
	35	10	3 12 6
	34	7	2 11 0

Mines.	Tons.	Purchasers.	Price.
East Pool	32	7	£2 8 6
	27	5	5 3 0
	19	7	3 19 0
South Tolgus	61	3	8 7 0
	56	8, 13	4 2 0
	50	8, 13	4 2 0
Wheal Basset	54	5	5 7 0
	48	5	5 0 0
	29	5	10 17 0
Dolcoath	50	10	4 19 6
	39	4, 6	4 18 6
	21	11	7 11 6
East Grenville	56	13	4 2 0
	41	10, 11, 13	7 5 0
	8	5	1 5 6
West Tolgus	90	10, 11	6 5 6
East Basset	37	1	7 14 0
	30	1	9 6 6
	13	2	12 6 6
South Crofty	56	8	2 7 6
	23	8, 10	5 1 6
Tincroft	54	10	3 5 0
	16	1	9 3 0
Wheal Grenville	45	10	5 17 6
Condurrow	23	6	6 3 0
Crane	15	1, 5	11 16 0
	7	1, 5	5 5 6
Stray Park	13	8	2 6 6
Roskear	11	4, 6	4 5 6
Wheal Crofty	11	10	2 11 0
Camborne Vean	10	4, 6	1 14 0

TOTAL PRODUCE AND VALUE.

	Tons.	Amount.
Clifford Amalgamated	905	£5,427 2 0
Wheal Seton	510	2,187 4 6
West Seton	421	2,492 13 6
East Pool	281	790 11 6
South Tolgus	167	943 19 0
Wheal Basset	131	843 11 0
Dolcoath	110	599 18 0
East Grenville	105	537 1 0
West Tolgus	90	564 15 0
East Basset	80	724 17 6
South Crofty	79	£249 14 6
Tincroft	70	321 18 0
Wheal Grenville	45	264 7 6
Condurrow	23	141 9 0
Crane	22	214 2 6
Stray Park	13	30 4 6
Roskear	11	47 0 6
Wheal Crofty	11	28 1 0
Camborne Vean	10	17 0 0

EACH COMPANY'S PURCHASE.

	Tons.	Amount.
1 Vivian & Sons	149¾	£1,065 6 1
2 Freeman & Co.	161	1,104 7 6
3 Grenfell & Sons	320¾	2,726 2 10
4 Crown Copper Co.*	—	—
5 Sims, Willyams, & Co.	214	1,549 8 3
6 Williams, Foster, & Co.	356	1,945 9 6
7 Mason & Elkington	461¾	2,431 5 4
8 Bankart & Sons	282½	812 12 9
9 Copper Miners' Co.	124	£520 16 0
10 Charles Lambert	471¾	2,254 8 2
11 Newton, Keates, & Co.	118¾	751 2 8
12 Sweetland, Tuttle, & Co.	186	563 5 0
13 Penclawdd Copper Co.	238½	690 6 5
Total	3,084	£16,425 10 6

Average Produce, 6¾ °/₀.
Quantity of Fine Copper, 197 tons.
Ore required to make a ton of Fine Copper, 15 tons 13 cwts.

Average Price per ton of Ore..... £5 6 6
Per Unit of Copper in Ore 0 16 8
Average Standard (nominal)..... 126 8 0

* The purchases made by No. 4 (Crown Copper Co.) are included in the total of No. 6 (Williams, Foster, & Co.), those firms being identical.

Copper Ores.

Sampled July 27, and sold at Tabb's Hotel, Redruth, August 11.

Mines.	Tons.	Purchasers.	Price.		
Carn Brea	69	7	£3	11	6
	63	3	7	10	0
	51	5	6	0	0
	49	2, 10	5	2	0
	48	7	5	0	0
	35	7, 10	2	16	0
	32	3	7	5	6
	21	10	1	14	6
West Basset	71	4, 6	4	17	0
	62	10	4	7	0
	61	1	6	14	6
	53	7	7	19	0
	36	5	15	9	0
	29	7	13	10	6
	28	10	4	7	6
Prosper United.....	74	7	3	3	6
	62	1	1	10	6
	60	8	5	12	6
	58	8, 10	2	12	0
	55	8	4	11	6
Levant	65	8	5	16	6
	57	8	5	3	6
	42	2	6	2	0
	35	8	1	4	0
East Carn Brea	55	4, 6	4	10	0
	43	10	4	10	0
	37	2, 10	7	13	0
	13	7	8	14	6

Mines.	Tons.	Purchasers.	Price.		
Rosewarne Consols ...	58	5, 10	£5	10	0
	47	1, 2	8	11	6
	41	1, 5	14	8	6
Par Consols	106	9	6	7	6
	30	10	3	14	0
Charlotte United.....	43	13	5	9	6
	31	10	2	17	6
	30	13	3	5	0
	28	6, 13	7	2	0
Rosewarne United ...	40	3	3	1	6
	33	4, 6, 10	6	6	0
Great South Tolgus...	36	7	6	8	0
	35	7	8	3	6
Copper Hill	32	10	1	18	6
	29	10	7	5	6
Botallack	36	5	4	1	0
Wheal Curtis	16	1, 5	2	5	6
	14	1, 5	4	14	6
Treffry's Regulus.....	25	1, 5	9	10	6
Boscaswell	20	1	4	19	0
South Carn Brea	16	9	6	0	6
Great Wheal Alfred..	15	12	3	15	0
Pendeen Consols	15	1	1	19	0
South Dolcoath	14	1	14	3	0
Alfred Consols	13	10	4	17	0
East Cuddra	9	9	4	11	0
Pembroke	2	1	0	0	6
Great Crinnis	2	1	12	0	0

TOTAL PRODUCE AND VALUE.

	Tons.	Amount.		
Carn Brea	368	£1,882	2	0
West Basset	340	2,516	11	0
Prosper United.....	309	1,069	8	6
Levant	199	958	16	0
East Carn Brea	148	837	9	6
Rosewarne Consols.....	146	1,313	9	0
Par Consols	136	786	15	0
Charlotte United.....	132	770	17	0
Rosewarne United	73	330	18	0
Great South Tolgus.....	71	516	10	6
Copper Hill	61	272	11	6
Botallack	36	145	16	0

	Tons.	Amount.		
Wheal Curtis	30	£102	11	0
Treffry's Regulus.....	25	238	2	6
Boscaswell	20	99	0	0
South Carn Brea.....	16	96	8	0
Great Wheal Alfred	15	56	5	0
Pendeen Consols	15	29	5	0
South Dolcoath	14	198	2	0
Alfred Consols	13	63	1	0
East Cuddra	9	40	19	0
Pembroke	2	0	1	0
Great Crinnis	2	24	0	0

EACH COMPANY'S PURCHASE.

	Tons.	Amount.		
1 Vivian & Sons	247½	£1,522	14	9
2 Freeman & Co.....	108½	724	3	9
3 Grenfell & Sons	135	828	6	0
4 Crown Copper Co.*	—	—		
5 Sims, Willyams, & Co..	260	1,633	11	0
6 Williams, Foster, & Co.	162	829	17	0
7 Mason & Elkington ...	374½	2,214	3	0
8 Bankart & Sons	301	1,367	2	6

	Tons.	Amount.		
9 Copper Miners' Co. ...	131	£813	2	0
10 Charles Lambert	418½	1,777	7	0
11 Newton, Keates, & Co.	—	—		
12 Sweetland, Tuttle, & Co.	15	56	5	0
13 Penclawdd Copper Co.	87	582	6	6
Total 2,180		£12,348	18	6

Average Produce, 7 %.
Quantity of Fine Copper, 153 tons 5 cwts.
Ore required to make a ton of Fine Copper, 14 tons 4 cwts. 2 qrs.

Average Price per ton of Ore	£5	13	0
Per Unit of Copper in Ore.....	0	16	1½
Average Standard (nominal)	119	14	0

* The purchases made by No. 4 (Crown Copper Co.) are included in the total of No. 6 (Williams, Foster, & Co.), those firms being being identical.

Copper Ores.

Sampled August 3, and sold at the Royal Hotel, Truro, August 18.

Mines.	Tons.	Purchasers.	Price.
Devon Great Consols.	133	11	£5 5 0
	128	10	3 13 0
	127	9	5 11 6
	121	1	5 15 0
	120	10	5 9 6
	118	3, 5	5 15 6
	114	7	5 10 0
	113	3, 5	5 9 0
	112	7	3 15 6
	111	12	2 5 6
	109	2, 4, 6	4 16 6
	107	3	5 4 6
	105	5	4 17 0
	103	6	4 8 6
	102	9	4 2 6
	99	1	2 7 0
	95	5	4 13 6
	83	10	2 2 0
	61	10	2 10 6
	52	3	5 11 6
	47	3	5 18 6
	46	3	13 17 0
	43	1	13 15 6
	5	1, 5	32 1 0
	3	1, 5	31 3 0
East Caradon	90	1	4 10 6
	88	10	4 1 6
	85	1	4 5 6
	78	5	4 4 6
	64	1	8 0 6
	54	6	6 5 6
	26	1	14 6 6
Marke Valley	86	6	2 16 6
	85	6	2 12 6

Mines.	Tons.	Purchasers.	Price.
Marke Valley	80	2	£2 14 0
	63	5	2 11 6
	36	11	5 18 6
	35	8	3 5 0
	30	1	1 12 0
Okel Tor.....	100	7	3 14 6
	97	4, 6, 9, 11	3 13 6
	72	7, 10, 12	1 12 6
West Martha.....	92	1, 5	1 0 0
	89	1, 5	0 17 0
	85	1, 5	1 11 6
Devon and Cornwall .	100	1	3 3 6
	81	10	2 11 6
	40	13	7 3 6
	29	5	14 13 0
Bedford United	100	4, 6	4 16 6
	95	1	4 18 0
Brookwood	60	9	3 10 0
	57	5	2 7 0
	40	1, 5	8 4 0
Wheal Crebor	53	6	5 7 6
	50	2	5 7 6
	19	9	4 9 0
Wheal Friendship ...	71	1, 6	9 1 6
	39	1	8 5 0
Crelake	98	1, 5	0 12 6
South Bedford	48	4, 6	1 7 0
	29	13	5 4 0
North Wheal Robert.	60	4, 6, 9, 11	5 2 6
Wheal Arthur	60	7	3 6 6
Kelly Bray	57	10	2 15 0
Sortridge Consols.....	20	13	3 4 6
	11	13	2 16 0
Fursden	25	4, 6, 9, 12	3 9 6

TOTAL PRODUCE AND VALUE.

	Tons.	Amount.
Devon Great Consols.....	2,257	£11,353 4 6
East Caradon	485	2,683 13 6
Marke Valley	415	1,219 7 0
Okel Tor.....	269	845 19 6
West Martha.....	266	301 10 6
Devon and Cornwall	250	1,237 18 6
Bedford United	195	948 0 0
Brookwood	157	671 19 0
Wheal Crebor	122	638 3 6
Wheal Friendship	110	£966 1 6
Wheal Crelake.....	98	61 5 0
South Bedford	77	215 12 0
North Robert	60	307 10 0
Wheal Arthur	60	199 10 0
Kelly Bray	57	156 15 0
Sortridge Consols.....	31	95 6 0
Fursden	25	86 17 6

EACH COMPANY'S PURCHASE.

	Tons.	Amount.
1 Vivian & Sons.....	1,033¼	£5,124 11 0
2 Freeman & Co.....	166½	660 1 2
3 Grenfell & Sons	367½	2,413 4 0
4 Crown Copper Co.*.....	—	—
5 Sims, Willyams, & Co..	692	2,816 18 3
6 Williams, Foster, & Co.	784¾	3,449 0 1
7 Mason & Elkington ...	410	1,660 16 0
8 Bankart & Sons	35	130 15 0
9 Copper Miners' Co. ...	353¼	£1 611 0 9
10 Charles Lambert	642	2,215 9 0
11 Newton, Keates, & Co.	208¼	1,077 10 10
12 Sweetland, Tuttle, & Co.	141½	313 14 11
13 Penclawdd Copper Co..	100	533 2 0
Total	4,934	£21,988 13 0

Average Produce, 5 11/12 %.
Quantity of Fine Copper, 280 tons 11 cwts.
Ore required to make a ton of Fine Copper, 17 tons 11 cwts. 3 qrs.

Average Price per ton of Ore £4 9 0
Per Unit of Copper in Ore 0 15 8
Average Standard (Nominal) 126 15 0

* The purchases made by No. 4 (Crown Copper Co.) are included in the total of No. 6 (Williams, Foster, & Co.), those firms being identical.

Copper Ores.

Sampled August 10, and sold at Tabb's Hotel, Redruth, August 25.

Mines.	Tons.	Purchasers.	Price.
South Caradon.....	73	1, 6	£7 10 6
	61	11	6 7 6
	60	1	15 14 6
	59	1, 6	15 19 6
	58	1, 6	6 4 6
	50	6	15 11 6
	39	5	15 2 0
	38	6	7 6 6
	25	9	6 1 6
Fowey Consols.....	78	6	5 4 6
	69	1	6 8 0
	67	5	5 2 0
	62	9	5 0 6
	60	1, 5	1 10 6
	59	1, 5	1 5 6
	45	1, 5	3 14 6
Tywarnhaile	71	8	2 0 6
	66	2, 12	1 18 6
	65	2	1 18 6
	54	3, 6, 12	2 2 6
	51	3, 7	2 7 6
	43	2, 3	6 5 0
	39	3	6 18 0
	28	3, 8, 12	2 0 6
Phœnix Mines	82	8	2 11 6
	80	8	3 10 6
	54	8, 13	5 3 0
	51	8	2 9 0
	50	8	4 16 0
	42	8	4 12 6
	33	8	1 12 0
West Damsel	66	4, 6	3 5 6
	64	7, 11	4 2 0
	54	7	4 4 0
	52	2	3 10 0
	42	2	3 15 0
	39	7	6 4 0
	38	6	5 3 6

Mines.	Tons.	Purchasers.	Price.
Clifford Amalgamated	80	5	£2 6 6
	57	5	2 5 6
	47	5, 12	1 5 6
	46	11	4 3 6
	36	5	3 4 0
	33	2, 5, 8	4 0 6
	27	5	4 5 0
Great Wheal Busy ...	72	10	3 4 0
	61	9	1 18 0
	59	2, 6	3 13 6
	51	7	1 1 0
	30	8	2 17 6
	26	1	1 6 6
	1	8	32 14 6
Craddock Moor.....	82	1, 2, 3	5 0 6
	57	13	8 0 6
	56	8	5 0 0
	21	5	0 13 0
	20	7	8 12 6
	12	7	4 0 0
Hallenbeagle.....	88	4, 6	3 11 0
	76	3	8 17 0
Great North Downs...	80	7	5 1 6
	60	7	4 4 0
	20	3	8 17 6
Glasgow Caradon.....	67	9	3 11 0
	65	2	2 16 6
Boscawen	47	2	3 4 0
	37	3, 4, 6	3 5 6
	31	2	9 16 0
Bampfylde'.....	51	13	13 2 6
Great Brigan.....	45	3	5 6 6
East Wheal Ellen ...	30	7	3 7 0
North Grambler	23	3, 7	8 5 6
Falmouth & Sperries.	21	1, 5	2 3 0
Wheal Prudence	13	1	2 16 6
Grambler	9	9	5 13 0

TOTAL PRODUCE AND VALUE.

	Tons.	Amount.
South Caradon	463	£4,983 3 0
Fowey Consols.....	440	1,836 15 0
Tywarnhaile.....	417	1,226 7 6
Phœnix Mine	392	1,383 5 0
West Damsel	355	1,483 6 0
Clifford Amalgam.	320	939 8 6
Great Wheal Busy	300	770 12 0
Craddock Moor.....	248	1,383 12 6
Hallenbeagle.....	164	987 4 0
Great North Downs	160	835 10 0

	Tons.	Amount.
Glasgow Caradon	132	£421 9 6
Boscawen	115	575 7 6
Bampfylde	51	669 7 6
Great Brigan	45	239 12 6
East Wheal Ellen	30	100 10 0
North Grambler.....	23	190 6 6
Falmouth & Sperries	21	45 3 0
Wheal Prudence	13	36 14 6
Grambler and St. Aubyn...	9	50 17 0

EACH COMPANY'S PURCHASE.

	Tons.	Amount.
1 Vivian & Sons	382 5-6	£2,709 16 6
2 Freeman & Co.....	424½	1,590 7 9
3 Grenfell & Sons	305½	1,883 16 4
4 Crown Copper Co.*.....	—	—
5 Sims, Willyams, & Co...	454	1,753 17 3
6 Williams, Foster, & Co.	525½	3,345 18 11
7 Mason & Elkington ...	415	1,788 1 6
8 Bankart & Sons	543½	1,850 12 6

	Tons.	Amount.
9 Copper Miners' Co. ...	224	£868 0 6
10 Charles Lambert	72	230 8 0
11 Newton, Keates, & Co.	139	712 2 6
12 Sweetland, Tuttle, & Co.	83 5-6	150 12 9
13 Penclawdd Copper Co..	135	1,265 17 0
Total 3,704		18,149 11 6

Average Produce, 6¼ %.
Quantity of Fine Copper, 231 tons 3 cwts.
Ore required to make a ton of Fine Copper, 16 tons 0 cwt. 2 qrs.

Average Price per ton of Ore £4 17 11
Per Unit of Copper in Ore 0 15 8½
Average Standard (nominal)..... 122 11 0

* The purchases made by No. 4 (Crown Copper Co.) are included in the total of No. 6 (Williams Foster, & Co.) those firms being identical.

Copper Ores.

Sampled July 27, and sold at Swansea August 16.

Mines.	Tons.	Produce.	Purchasers.	Price.
Berehaven	90	9¼	7	£7 18 0
	60	9¼	6	7 18 0
	89	11¼	6, 7, 9	9 4 0
	126	10¼	7	8 9 0
	93	9¼	1, 9	7 19 6
	80	9¼	3	7 16 0
	88	10¼	9	8 13 0
	71	9¼	13	7 18 6
	125	10	1, 2, 3, 6, 7, 11	8 0 0
Knockmahon	91	9	2	7 7 6
	70	13¼	6	11 0 0
	71	13¼	6	11 0 0
	79	9¼	1	8 1 0
	45	8¼	3	6 18 0
	90	9¼	1	8 2 6
Knockmahon	38	10¼	5	£8 6 0
Cobbing	91	7¼	13	5 10 6
Seville	83	3¼	5	1 16 0
Cape X	29	38¼	5	32 17 6
British Regulus	60	24¼	5	19 16 0
	12	25¼	5	20 18 0
Ballycummisk	14	14¼	2	11 17 0
	25	9¼	2, 6	8 1 0
	29	5¼	2	4 0 6
Concordia	18	21¼	6, 7	18 10 0
	6	17¼	7	14 18 0
New Cornwall Min. Assoc.	26	18¼	9	15 12 0
Kanmantoo	17	50¼	3	42 3 0
Copper Ore	4	6¼	7	4 16 0

TOTAL PRODUCE AND VALUE.

	Tons.	Amount.
Berehaven	762	£6,325 11 0
Knockmahon	484	4,215 4 6
Cobbing	91	502 15 6
Seville	83	149 8 0
Cape X	29	953 7 6
British Regulus	72	1,438 16 0
Ballycummisk	68	£483 17 6
Concordia	24	422 8 0
New Cornwall Mineral Association	26	405 12 0
Kanmantoo	17	716 11 0
Copper Ore	4	19 4 0

EACH COMPANY'S PURCHASE.

	Tons.	Amount.
1 Copper Miners' Co.	236¼	£1,904 13 1
2 Freeman & Co.	167¼	1,221 0 10
3 Grenfell & Sons	162 5-6	1,817 14 4
4 Crown Copper Co.	—	—
5 Sims, Willyams, & Co.	222	2,856 19 6
6 Vivian & Sons	273	2,681 14 6
7 Williams, Foster, & Co.	285½	2,490 8 0
8 British & For. Copper Co.	—	—
9 Mason & Elkington	140¼	1,378 1 5
10 Bankart & Sons	—	—
11 Charles Lambert	20 5-6	166 13 4
12 Ravenhead Copper Co.	—	—
13 Sweetland, Tuttle, & Co.	162	1,065 9 0
14 Jennings & Co.	—	—
15 Penclawdd Copper Co.	—	—
16 Mona Copper Co.	—	—
Total	1,670	£15,632 15 0

Price per Unit of Copper in British and Irish Ores, 16*s.* 4¼*d.*
British and Irish Ore required to make a ton of Fine Copper, 9 tons 8 cwts. 0¾ qr.

Price per Unit of Copper in Foreign and Colonial Ores, 16*s.* 5½*d.*
Foreign and Colonial Ore required to make a ton of Fine Copper, 5 tons 11 cwts. 1 qr.

Sundry Copper Ore Sales.

Dates.	Mines.	Tons.	Price per ton. £	s.	d.	Purchasers.	Amount of Money. £	s.	d.
Aug. 5.	Lot 1	33	25	17	6	St. Helen's Co.	8,757	18	9
	2	33	25	17	6	Newton, Keates, & Co.			
	3	57	18	17	6	ditto			
	4	57	18	17	6	ditto			
	5	57	18	17	6	St. Helen's Co.			
	6	57	18	17	6	ditto			
	7	28½	18	17	6	ditto			
	8	28½	18	17	6	Newton, Keates, & Co.			
	9	56	18	12	6	St. Helen's Co.			
	10	24½	25	12	6	ditto			
„ 16.	Parys Mines:—								
	Lot 1 (copper ore)	155	6	4	0	Newton, Keates, & Co. C. Lambert	2,429	4	0
	2 „	155	6	4	0	Mona Co.			
	3 (copper precipitate)	64	7	18	6	ditto			
„ 24.	West Canada Co. (ex Thurmutis)	77	17	7	6	Newton, Keates, & Co.	6,660	10	0
	„ „	77	17	5	0	Bibby, Sons, & Co. St. Helen's Co.			
	„ „	77	17	3	6	ditto			
	„ „	77	17	8	0	ditto			
	„ „	77	17	6	0	Newton, Keates, & Co.			
	Connorree Mining Co. (ex Henry)	57	2	7	6	J. Keys & Son	262	15	6
	„ „	56	2	5	6	ditto			
	Great Laxey	200	4	17	6	St. Helen's Co.	975	0	0

Copper Ores.

Sampled August 10, and sold at Swansea August 30.

Mines.	Tons.	Produce.	Purchasers.	Price.		
Cobre	100	12¼	6	£10	3	0
	98	12½	1	10	3	6
	96	12¾	6	10	6	0
	106	12½	3	10	7	0
Cape Copper	57	33¼	8	28	16	0
	51	33¾	8	28	18	6
	57	38¼	3	33	10	0
	53	39¼	2	33	14	0
Cape Copper	11	37	7	£31	5	6
	8	35½	7	31	4	0
Cuba (Mantua)	125	7	6	5	10	0
	123	7½	6	5	13	0
Knockmahon	137	12¼	7	11	0	0
Berehaven	124	10¼	9	8	15	6
British Regulus	19	16¼	6	14	10	0

TOTAL PRODUCE AND VALUE.

	Tons.	Amount.		
Cobre	400	£4,098	1	0
Cape Copper	237	7,406	0	0
Cuba	248	1,382	9	0
Knockmahon	137	£1,507	0	0
Berehaven	124	1,088	2	0
British Regulus	19	275	10	0

EACH COMPANY'S PURCHASE.

	Tons.	Amount.		
1 Copper Miners' Co.	98	£997	3	0
2 Freeman & Co.	53	1,786	2	0
3 Grenfell & Sons	163	3,006	12	0
4 Crown Copper Co.	—	—		
5 Sims, Willyams, & Co.	—	—		
6 Vivian & Sons	463	3,661	15	0
7 Williams, Foster, & Co.	156	2,100	12	6
8 British & For. Copper Co.	108	3,116	15	6
9 Mason & Elkington	124	1,088	2	0
10 Bankart & Sons	—	—		
11 Charles Lambert	—	—		
12 Ravenhead Copper Co.	—	—		
13 Sweetland, Tuttle, & Co.	—	—		
14 Jennings & Co.	—	—		
15 Penclawdd Copper Co.	—	—		
16 Mona Copper Co.	—	—		
	1,165	£15,757	2	0

Price per Unit of Copper in British and Irish Ores, 17*s.* 1¼*d.*
British and Irish Ore required to make a ton of Fine Copper, 8 tons 7 cwts. 0½ qr.

Price per Unit of Copper in Foreign and Colonial Ores, 16*s.* 8½*d.*
Foreign and Colonial Ore required to make a ton of Fine Copper, 5 tons 14 cwts. 2¾ qrs.

Black Tin Sales.

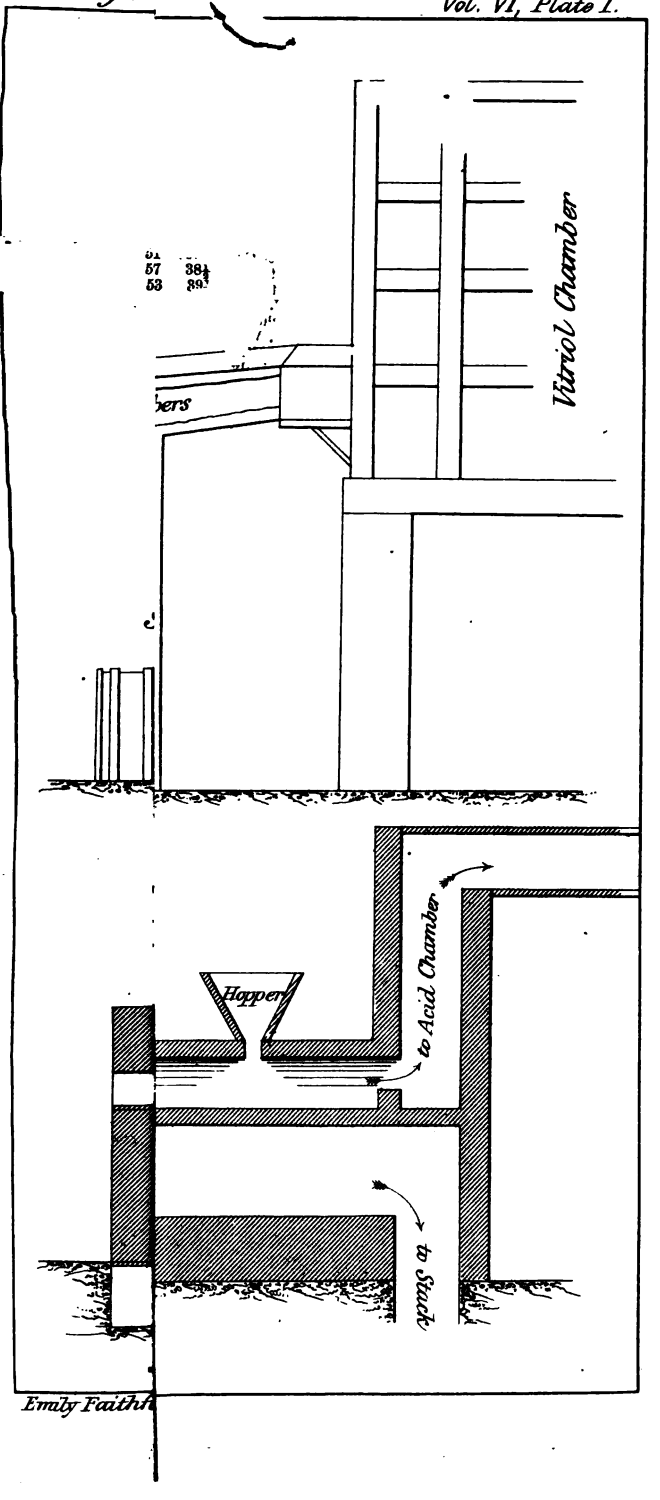
Dates.	Mines.	Tons.	c.	q.	lbs.	Price per ton. £	s.	d.	Purchasers.	Amount of Money. £	s.	d.
June 20.	Wheal Par	2	6	3	11	65	12	6	Redruth Co.	294	18	10
July 16.	„	2	3	3	14	64	7	6	ditto			
„ 22.	Wheal Sydney	3	9	3	14	64	7	6	Daubuz	224	18	2
„ 27.	Wheal Grenville	8	12	2	27	64	0	0	Bissoe Co.	639	17	3
	„	1	13	2	15	51	12	6	ditto			
	East Grenville	2	14	2	16	63	5	0	Mellanear	191	8	6
	„	0	7	1	5	54	0	0	ditto			
„ 28.	Gurlyn	3	17	2	18	59	0	0	—	229	2	0
	Leeds and St. Aubyn	5	9	1	23	63	2	6	Chyandour	345	9	0
	Gurlyn	3	17	2	18	59	0	0	ditto	229	2	0
„ 29.	Cornubia	4	6	2	10	65	6	0	—	281	8	3
„ 30.	North Jane	1	4	3	7	—			Daubuz & Co.	72	5	3
	Pedn-an-drea	9	0	1	25	—			—	535	19	6
Aug. 6.	Phœnix	14	10	2	22	55	15	0	Enthoven & Sons	810	6	4
„ 17.	Wheal Par	3	18	2	3	65	12	6	Redruth Co.	258	5	0
„ 18.	Great Wheal Vor United	47	13	0	10	—			—	3,172	14	6
„ 19.	Wheal Sidney	5	2	3	13	65	0	0	Carvedras Co.	334	6	4
„ 20.	Penhalls	6	9	1	14	—			—	420	3	6
„ 22.	Furze Hill Wood	2	16	1	25	63	15	0	Harvey & Co.	362	9	2
	„	2	17	0	27	63	15	0	Calenick Co.			

Blende Sales.

Dates.	Mines.	Tons.	Price per ton. £	s.	d.	Purchasers.	Amount of Money. £	s.	d.
Aug. 5.	Minera	126	6	9	6	Vivian & Sons	1,118	3	0
	„	25	5	0	0	ditto			
	„	18	4	12	0	ditto			
	„	18	5	5	0	H. Southern			
„ 18.	Isle of Man Mining Co.	30	2	5	0	ditto	67	10	0
„ 24.	Great Laxey	300	4	12	0	Vivian & Sons	1,380	0	0

Lead Ore Sales.

Dates.	Mines.	Tons.	Price per Ton. £	s.	d.	Purchasers.	Amount of Money. £	s.	d.
Aug. 1.	East Logylas	70	14	2	6	Panther [illegible]	20	18	0
	Glogfach	60	18	15	0	dit [illegible] 14½ 2	11	17	0
	Cwmystwith	100	14	5	6	dit [illegible] 9½ 2, 6	8	1	0
„ 2.	Wheal Frank Mills	100	17	18	6	J. & J [illegible] 6½ 2	4	[illegible]	[illegible]
„	„	85	14	10	0	R. Mic[illegible] [illegible] 21¼	3,025	0	0
„ 3.	Wheal Mary Ann	46	28	18	6	J. & J [illegible]ms	1,330	11	0
„ 4.	Great Laxey	100	26	2	6	J. & J. W[illegible]ams	2,612	10	0
„ 5.	Minera	100	14	10	0	Sims, Willyams, & Co.			
	„	100	14	10	0	ditto			
	„	100	14	12	6	Brymbo Co.			
	„	76	14	14	0	ditto	8,000	9	6
	„	100	14	8	6	Walker, Parker, & Co.			
	„	27	14	9	6	Brymbo Co.			
	„	42	14	10	6	ditto			
	„	6	12	18	0	ditto			
	Cargoll	55	18	5	6	—	1,231	12	9
	„	14½	8	14	6	—			
	Silver Mountain	20½	14	11	0	Sims, Willyams, & Co.	298	5	6
„ 6.	Herodsfoot	70	30	2	6	—	2,108	15	0
	Minera Boundary and Lower Eisteddfod	30	14	3	6	Brymbo Co.	425	5	0
„ 10.	Isle of Man Mining Co.	100	25	14	0	Stock & Co.	2,570	0	0
„ 11.	Talargoch (Maesyrerwddu)	30½	15	1	6	A. Eyton			
	„ (Coetla Llys)	69½	15	12	6	Newton, Keates, & Co.	2,639	9	6
	„	69½	15	12	6	Walker, Parker, & Co.			
	Deep Level	15	14	1	0	Newton, Keates, & Co.	210	15	0
	Rhosesmor	25	13	13	6	ditto			
	„	25	13	13	6	Walker, Parker, & Co.	1,375	0	0
	„	50	13	16	6	ditto			
	Parry's	16	14	11	0	ditto	232	16	0
	Bryn Gwiog	45	15	1	0	ditto	677	5	0
	Long Rake	25	14	1	0	Newton, Keates, & Co.	351	5	0
	Billins	6	14	11	6	ditto	174	18	0
	„	6	14	11	6	Walker, Parker, & Co.			
	Speedwell	7	12	18	6	Newton, Keates, & Co.	90	9	6
	Pennant	12	14	3	6	Walker, Parker, & Co.	170	3	6
	North Henblas	20	13	18	0	Newton, Keates, & Co.	278	0	0
	Dog Pit	12½	13	15	6	Walker, Parker, & Co.	172	3	9
	Roman Gravels	20	14	6	0	ditto	286	0	0
	Dyfngwm	21	13	18	6	ditto	292	8	6
	Llanerchyraur	5½	14	0	6	ditto	80	12	10½
	Aberdovey	4½	14	3	0	ditto	63	13	6
	Talisker (Australia)	41	12	0	6	J. & J. Williams	493	0	6
„ 15.	Frongoch	120	13	18	0	Sims, Willyams, & Co.	1,668	0	0
	West Frongoch	20	12	6	0	Panther Co.	246	0	0
	East Darren	37½	17	0	0	ditto	1,275	0	0
	„	37½	17	0	0	Newton, Keates, & Co.			
	Cwm Erfin	27	17	3	0	Sims, Willyams, & Co.	1,088	13	6
	„	35	17	17	6	Treffry's Trustees			
„ 16.	Twelve Apostles	40	14	2	6	A. Eyton	565	0	0
„ 19.	Dyliffe	38	14	4	0	ditto	539	12	0
„ 20.	Bronfloyd	25	14	5	0	Sims, Willyams, & Co.	356	5	0
„ 22.	Dyliffe	75	13	17	6	Walker, Parker, & Co.	1,040	12	6
	Hope	25	15	0	6	Newton, Keates, & Co.	375	12	6
„ 25.	Westminster	40	14	1	6	A. Eyton	563	0	0
	Hendre Ucha	15	13	18	6	Newton, Keates, & Co.	208	17	6
	Bryngwyn	6	14	8	6	Walker, Parker, & Co.	177	0	0
	„	6	15	1	6	A. Eyton			
	Pant-y-Mwyn	14	13	15	0	ditto	192	10	0
	Fron Hall	7½	14	0	6	Newton, Keates, & Co.	109	16	1½
	„	1½	6	10	0	ditto			
	Cwmbyr	21	13	5	6	ditto	278	15	6
	Llanerchyraur	6	14	1	6	ditto	84	9	0


Vitriol Chamber
Hopper
to Acid Chamber
to Stack

THE

MINING AND SMELTING MAGAZINE.

OCTOBER, 1864.

On the Thermal Water of the Clifford Amalgamated Mines, Cornwall.

By Warington Smyth, M.A., F.R.S., Sec. G.S.
Chief Inspector of Crown Mines.

The attention of the British Association has been called by Sir Charles Lyell to the phenomenon of springs of water at a very high temperature, which were discovered a few years ago in one of the deepest of the Cornish copper mines. Professor Miller's recent investigations have proved in those waters the existence of the new metal Cæsium, and of an unexampled proportion of another of the rarer metals, Lithium, now coming into use as a medicine, and have thus added a fresh interest to a topic of high scientific importance.

In the neighbourhood of Redruth, and situated mostly in the parish of Gwennap, is a district equally remarkable for the high temperature of its deep mine-workings, and for the enormous value of the copper ores extracted from them within the last half century. The constituent rock of this region, is mostly the clay-slate, or *killas*, which, abutting against the granite dome of Carn Marth, dips away from that hill towards the east, and has not been unbottomed in the deepest mines about to be mentioned, although there can be no reasonable doubt that the granite would be found occurring again beneath it. The clay slate is intersected by dykes of *elvan* or granitic-porphyry, coursing in an east and west direction; by lodes or mineral veins having on the whole a very similar line of strike; and by cross-courses, or non-metalliferous veins, running north and south. The more notable mines of this district have been Poldice, Wheal Uvell, Ting Tang, Wheal Squire, the Consolidated Mines, the United Mines, and Wheal Clifford, worked with various success to depths of from 1,000 to near 1,900 feet from the surface. Certain of them are at present in abeyance, others have lately received new

appellations, and thus the so-called "hot-spring" met with a few years ago in the United Mines is now by a different arrangement of the Setts included in the group known as the Clifford Amalgamated Mines.

It is above a quarter of a century ago that a valuable series of observations on the temperature of the water of mines in Cornwall was made by Mr. William Jory Henwood, F.R.S.; and his exact tables of statement and deduction showed the Redruth district to be one of the most remarkable for the high temperature, in its deep working places, of the waters, whether issuing from the lodes or from the encasing rocks. Thus, at Poldice, about a mile north of the United, and upon parallel lodes, the water flowing out of the lode, at 184 fathoms, or 1,104 feet deep, exhibited a *maximum* temperature of 100° Fahr.; at the Consolidated Mines, at 294 fathoms, or 1,764 feet, the water in the bottom of a level in the South Branch, or vein, was 95°·5; at the United Mines, in the western part, or Poldory, a large gush of water from the elvan course at 184 fathoms, or 1,104 feet, reached 90° Fahr. In the eastern portion of the United Mines, called Ale and Cakes, a moderate spring flowing from the rock between the Great South lode and the Old lode, at 195 fathoms deep, showed a temperature of 93·5. A stream cut in the rock adjoining the Great South lode, in the eastern end, at 210 fms., or 1,260 feet deep, was 92°. Hence it was well known that the subterranean springs of this district attained, at these considerable depths, and at many points, a temperature higher than was consistent with the increment usually allowed for a given increased depth from the surface.

In the year 1839, a perpendicular shaft having been sunk to a greater depth than that at which the Old Lode of the United Mines had hitherto been worked, a cross-cut was driven from it at the 180 fathom level (about 225 fathoms deep), which intersected the vein at a spot about a quarter of a mile farther west than the points at present in operation; and here a large feeder of water was encountered, of so much higher a temperature than had before been observed, that it was at once termed a hot spring, and the lode the "hot lode." A splendid course of copper-ore rewarded the spirit of the adventurers, and has been followed up eastward and downward ever since.

The shaft being deepened by successive stages, it has been found that at each deeper point at which the chief flow of water has been seen, it has been prevented by the excavations from rising farther upward, and has shown a marked accession of temperature. In 1855 I found it welling up abundantly from a fissure extending along the north wall of the lode, at about 1,510 feet from the surface, with a temperature of 114° Fahr. At a rather greater depth, in a cross-cut driving to meet the vein, although the air was almost intolerably stifling, the temperature of the water was several degrees lower, because the main stream had not yet been intersected. In July last, these parts of the workings had been laid dry by the extension of deeper galleries, and the point of egress of the springs was, along with the working of the rich lode, advanced many fathoms farther eastward. At present the bottom level is the 230 fathoms, which, as the adit or

datum line, is 45 fathoms from the surface, is 275 fathoms or 1,650 feet deep: in its end the lode was narrow, and very impervious to water; but a little rill trickling from it showed a temperature of 121°, whilst a larger feeder, which fell from an upper working, was 119° to 120°. The next level above, called the 225 fathom level, (below adit), is advanced farther eastward by some 70 fathoms; the lode exhibited a good breadth of fine black-coated copper pyrites; and small feeders of water, issuing mostly from the north, or hanging wall, almost scalded the fingers holding the thermometers, which marked 122°—whilst the air in the last few feet was at 112°, and loaded with vapour. Here, however, the principal body of the upward-flowing current was not yet intersected; it was to be seen a few fathoms further to the east, at the base of the stopes of the 220 fathom level, rising amid a quantity of loose material on the north side of the magnificent lode of cellular, black-stained, cinder-like, pyrites, which is there in full work. From 12 to 16 feet in width, and for many fathoms in height and length, these step-like workings consist of so large a proportion of valuable sulphides as to turn out, per fathom, sometimes as much as 26 tons of rich copper ore. Both the walls and the metallic contents are so hot as almost to scorch the hand when fairly laid upon them; but as the ore by degrees gets worked away, and the excavations remain exposed for months and years to a powerful current of wind brought in through the 208 fathom level, the temperature decreases, and an average of 83° is what the miners consider the *cool* air of their resting places in the 220.

Although 122° was the highest degree of heat which I observed, I think it highly probable that when the hotter level, the 225, is advanced a little farther eastward the temperature will be found in the chief gush of water somewhat higher.

The circumstance of the hot springs being attendant upon the rich and cindery-looking, loose-textured, course of ore, has induced many to look for the cause of the high temperature in the decomposition of the pyrites; but the absence of sulphates of copper and iron in the water, and the fact that where most exposed to oxidation, nearer the surface, the rich lodes never exhibit phenomena so remarkable, appear sufficiently to set aside such an hypothesis. We shall therefore have to look to deep seated sources of heat, such as have been adverted to by Sir C. Lyell in his address, for a more probable explanation of the observed appearances. The amount of water delivered from the Clifford spring is estimated at 150 gallons per minute, and since analysis proves it to contain a large proportion of chloride of sodium, whilst all the depths above mentioned as below the adit are, with a deduction of 10 or 12 fathoms, below the sea level, the suggestion has been thrown out that the influx is derived directly from the sea; but the very low percentage of magnesian salts, in comparison with that in sea-water, introduces a great difficulty, and the position of the group of mines is not less unfavourable to such a view. The flow of the water takes place with most facility, it would appear, along the strike of the lode, E.N.E. and W.S.W. by the true meridian; a direction in which the vein is retained inland, dying out after a time eastward, and passing westward through Wheal Squire

and Ting Tang mines into the granite of Carn Marth. In the middle of this run, at Poldory, it is intersected and heaved by numerous cross-courses; but these, although offering tolerably free passage to water, appear never to have yielded it at a remarkably high temperature. The *elvan* or porphyritic dyke, which, coursing parallel with the lode, is in some limited parts brought into such a position as to form one of its walls, seems not to have any necessary connection with the high temperature of the water.*

For the understanding of the phenomena of these thermal waters the following circumstances deserve attention. They appear to have been found only on the workings attaining a certain depth, above which they were prevented from rising in large volume, and at their exceptionally high temperature. This may be accounted for, partly by the closer texture of the lode, which was small and poor above that level; and partly, as appears probable, by the diffusion of the waters over a large area—certainly along this line of lode, if not extending to others of the neighbouring lodes, where hot water has been cut at medium depths. The very hot spring cut at Poldice, as mentioned above, can hardly be the same as the Clifford, since between the two mines are situate the Consolidated mines, which were worked to a greater depth than either, without intercepting it. Along the old or hot lode, however, it is about one mile from Poldory to the present ends in Wheal Clifford, throughout which distance exceptionally hot water has been cut at intervals; and the principal outlet has travelled a quarter of a mile eastward in the last twenty years. A comparison of the temperatures at equal depths in the ten different districts tabulated in Mr. Henwood's Table II., establishes the curious fact, that at a shallow horizon, down to about 100 fathoms, the Redruth district exhibited a lower average than the mean of the whole, and only on getting below 150 fathoms, took the lead of the others.

As regards the increment of temperature, it is somewhat startling. Between my last two visits, made at an interval of nine years, on both of which I carried down trustworthy thermometers, the point of issue of the hottest water had been deepened 30 fathoms or 180 feet, and the temperature was increased by 8° Fahr. This would give 1° for 22½ feet; whilst a comparison with Mr. Henwood's observation at Poldory would give a much higher ratio, 1° for 16 feet. The same uniform rate of increase would bring us to the boiling point of water at an additional depth of from 1,440 to 2,000 feet. The facts are thus so full of interest, physical as well as chemical, that it is to be hoped the commercial success of the last increase of depth may be great enough to lead to a further advance into the deep.

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* It is worthy of observation that in parts of some of the deeper levels the elvan is found to form one wall of the lode, whilst killas encloses it on the opposite side; whence it is perfectly clear that the formation of the vein-fissure was accompanied by a dislocation of the rocks through which it passes.

Analysis of a Hot Spring in Clifford Amalgamated Mines.

By Prof. W. A. Miller, M.D., Vice-President R.S.

For the water with which the following analyses were made I am indebted to the courtesy of Mr. Horton Davey, who, at the request of Sir C. Lyell, forwarded it to me in London.

This hot spring is the most abundant source of lithia at present known; the proportion of this salt per gallon being eight or ten times as great as that of any spring hitherto examined. The quantity of chloride of lithium furnished by it, taking its flow at 150 gallons per minute, at which it was roughly calculated by Mr. H. Davey, and the amount of chloride of lithium at 26 grains per gallon, would not be less than 800lbs. in the 24 hours. The existence of cæsium in quantity somewhat considerable for an element hitherto so rare adds to the interest with which this water will be regarded. I have not as yet attempted to estimate the amount of cæsium contained in the water.

Lithium has been in some cases employed medicinally, but its high price has hitherto restricted its use. The discovery of a new and practically inexhaustible source of supply will, therefore, no doubt, be hailed with satisfaction both by chemists and medical men. Extraction of the alkali on a large scale would not be difficult.

For this purpose the water must be concentrated to about one-twelfth of its original bulk, or till it acquires a sp. gr. of 1080. To the boiling liquid a concentrated solution of carbonate of sodium must be added so long as it produces a precipitate. A copious granular precipitate, consisting chiefly of carbonate of calcium, but carrying with it a little carbonate of lithium, is speedily deposited. The clear liquid must be decanted, mixed with sufficient hydrochloric acid faintly to redden litmus, and then boiled down; it contains only alkaline chlorides. Part of the chloride of sodium must be crystallised out, and on adding carbonate of sodium to the concentrated brine, impure carbonate of lithium will be deposited. The mother liquor still retains the salts of cæsium, and these may be separated by the addition of perchloride of platinum, following exactly the method given by Bunsen and Kirchhoff (*Phil. Mag.*, Nov. 1861).

For particulars respecting the geological features of this remarkable hot spring the reader is referred to the paper of Prof. W. Smyth.

King's Coll., Lond.
Sept. 1864.

Wm. Allen Miller.

Temperature of Spring 122°—125° in 230 fm. level; average yield, about 150 gallons per minute; specific gravity at 60° Fahr. 1007.

	Grains.
Fixed salts on evaporation, in grains per imp. gallon .	646·1

	Grains.
Consisting of—	
Chloride of potassium with a little chloride of cæsium	14·84
Chloride of lithium	26·05
Chloride of sodium	363·61
Chloride of magnesium	8·86
Chloride of calcium	216·17
Sulphate of calcium	12·27
With traces of oxides of iron, manganese, and aluminum	
Silica	3·65
	645·45

	Cubic Inches.
In 1 imp. gallon the gases amounted to	8·91
Consisting of—	
Carbonic acid	1·89
Oxygen	1·72
Nitrogen	5·30
Ratio of oxygen to nitrogen gas	1 : 3

The Copper Standard.

WITH reference to the suggestions made in our last number, as to the adoption of some rational principle in ascertaining the real fluctuations in the price of copper ores, the following article, which we reproduce *verbatim* has appeared in the *Mining Journal*:—

THE COPPER ORE STANDARD.—The proposition of the *Mining and Smelting Magazine* to adopt Sir William Logan's formula (see Percy's *Metallurgy*, p. 449) for ascertaining the cost of smelting sufficient ore to produce a ton of copper is not worthy of adoption, as will at once be seen by taking a very wide difference of produce, and calculating the price which it gives as that for which the copper contained in *one* ton of ore can be extracted. Thus, Sir William Logan's example—

$$\frac{100 \times \overline{10 + (8 \times 1s.\ 9d.)}}{8} = 15l.$$

is about correct for that particular produce, since, inasmuch as it will require 12½ tons of such ore to yield 1 ton of copper, it gives 1*l.* 4*s.* per ton as the cost of smelting each ton of ore, which is about the average, though a little too high. Now, were the formula of practical value, it is obvious that it should show a price above 1*l.* 4*s.* for a produce below 8, and a price below 1*l* 4*s.* for a produce above 8. Sir W. Logan's formula shows just the reverse. To make the error at once apparent, let produces 2 and 50 respectively be calculated. Now—

$$\frac{100 \times \overline{10 + (2 \times 1s.\ 9d.)}}{2} = 33l.\ 15s.$$

which is absurd, because inasmuch as it would require 50 tons of this ore to yield 1 ton of copper, it would make it appear that the copper in 1 ton of ore of

2 per cent. produce could be obtained for 13*s.* 6*d.*, which is far too low. Taking 50 per cent., the error is equally great, because—

$$\frac{100 \times \overline{10 + (50 \times 1s.\ 9d.)}}{50} = 8l.\ 15s.$$

would lead to the supposition that, although a ton of ore containing only 8 per cent. of copper can be made to yield up its value for 1*l.* 4*s.*, it costs 4*l.* 7*s.* 6*d.* to get out the copper if it be contained in the ore in the proportion of 50 per cent. Now, to suppose that it is an advantage to the smelter to have 98 per cent. of impurities instead of 50 per cent. (which Sir William Logan's formula proves) is sufficient to show that the new method of calculation is not a considerable improvement on the old.

We need scarcely point out, to any of our readers in the least degree conversant with the subject, that this article is, from beginning to end, a succession of the most egregious blunders. The writer can know nothing whatever of the subject he discusses. In the first place, the examples given are not on Sir William Logan's formula at all, but on Dr. Percy's modification of it. This, however, is not material—except as showing a general looseness of statement—for the reasoning applies equally to both.

The first proposition of the writer is that, if an 8% costs £1 4*s.* per ton to return its copper contents, "it is obvious" that it would cost *more* than £1 4*s.* for a produce *below* 8% and *less* than £1 4*s.* for a produce *above* 8%. Now, the converse of this is the most notorious fact in copper-smelting. If an 8% ore did cost £1 4*s.* per ton to return its copper, *cæteris paribus* a 6% ore would cost *less* per ton, and a 10% ore would cost *more* per ton. So that "which is absurd" is the writer's own proposition. If, instead of endeavouring to evolve a theory of the cost of smelting copper ore out of his own consciousness, he ever condescends to study the ticketing papers, he will find—much as it may surprise him—that the cost of returning copper (*per ton of ore*) from a 50% ore is about *four times* as great as from an 8% ore, and *seven* times as great as from a 2% ore. Not that the logical conclusion he draws from this, viz.:—"that it is an advantage to the smelter to have 98% of impurities instead of 50% (which Sir William Logan's formula proves)," at all follows. Sir William's formula proves nothing of the kind, and our writer's logic is—if possible—worse than his facts. The lower the produce of the ore (within ordinary commercial limits) the *less* it costs, *cæteris paribus*, to return the copper, per ton *of ore*; but the *more* it costs per ton of copper. The same quantity of copper is of course more valuable to a smelter in a 50% ore than in an 8% ore, or *à fortiori*, than in a 2% ore. So no one ever dreamt of such an absurd proposition as the *Mining Journal* writer fancies he can draw from Sir William Logan's formula. Because the copper in a 2% ore can be got out for very much less money *per ton of ore*, than it can out of a 50% ore, it by no means follows a *ton of copper* cannot be got out for very much less money from the richer ore. In fact the writer seems to have muddled up together the wholly distinct matters of the cost of producing a *ton of copper*, and the cost of getting the copper out of a *ton of ore*.

In palliation of such an amazing blunder, it is only fair to state that the true result may not be very obvious *à priori*, inasmuch as the grandfather of the present Mr. H. H. Vivian is said to have been the first person clearly to have apprehended it. Consequently it is only three generations old; but still a fact in copper-smelting three generations old, and by which the prices of ores have been regulated for three-quarters of a century, might fairly be expected to be known to the *Mining Journal*. Surely, at any rate, the writer, who must have known that he was wholly unacquainted with the subject, should, in common prudence, have paused before asserting, so dogmatically, propositions which, if true, would have proved Sir William Logan, Dr. Percy, and the copper-smelters he consulted to have stated the wildest nonsense. That this, or any other, formula is, or can be, strictly applicable to all cases, is of course a proposition that no one pretends to put forth; and a criticism, by competent persons, of the slight errors it may show in certain cases would be very useful.

We have prepared a series of elaborate analyses of the ticketing papers, to establish, even to the comprehension of the dullest, these facts beyond further controversy. The great pressure on our space this month compels us, however, to postpone them. Indeed we doubt if they are necessary; for, after all, it seems like breaking a fly on a wheel to go about seriously proving what has been accepted for 50 years as self-evident. We may state that we have had the opportunity, within the month, of consulting Sir William Logan, who is at present in England.

Our notice of the subject has, however, we are glad to say, had the effect we mainly desired. During the past month, the *Mining Journal* and the Cornish papers have given the price per unit realised by the copper in the ores.

On the Economising of the Sulphur Evolved in the Operations of Copper Smelting.

By Peter Spence, of Manchester.

It may seem presumptuous in a chemical manufacturer who has hitherto confined his operations chiefly to one department of practical chemistry—namely, the manufacture of alum—to undertake the task of effecting a material change in the *modus operandi* of the important metallurgical processes of copper smelting; processes conducted as they are on an extensive scale, by firms of large means, great knowledge, and long experience.

In mitigation of criticisms on this ground, let me say that it has been my experience as a manufacturing chemist that has led me in the direction of copper smelting; and that it was the necessities of my own business that impelled me into those investigations, with

results which I expect will be of considerable importance both in chemical manufacture and copper smelting.

It is well known to those conversant with our staple chemical manufactures that, for many years back, a large proportion of the sulphuric acid required in them has not been produced from the sulphur imported from Sicily, but has been made from iron pyrites (bi-sulphide of iron) which is largely found in Ireland and Cornwall, and is also largely imported from Belgium and other parts of the Continent; and that, more recently, immense deposits of pyrites, rich in sulphur and containing from 2 to 4% of copper, have been found in the Peninsula, on the borders of Spain and Portugal. These last-named pyrites have come into extensive use, and from their richness in sulphur are preferred to the pyrites derived from other sources; so that the importers get a higher price for them than the value of the copper they contain, and consequently seldom sell them to the copper smelters at Swansea. The chemical manufacturer, in fact, has to purchase these ores at the value of both the copper and the sulphur; and, after extracting the sulphur, has generally to sell the ore to the copper smelter, thus incurring a heavy cost in carriage on an article of small value per ton, and sometimes also a large loss from the uncertainty of the ordinary mode of assaying.

From these circumstances, I found that, in using Spanish pyrites, the sulphur was costing me rather a heavy sum; and in 1861 I began to look round for some mode of lessening this cost. By extracting the copper from the burnt ores, if it could have been done without loss, I found I would save 600*l.* per annum in the mere carriage of the burnt ore to the smelters.

I first, in connection with my friend Mr. Rumney, of Manchester, went into the wet method of extracting copper. But having operated on nearly 2,000 tons, by various modifications of this method, our success seemed so problematical, that the experiment was abandoned with a loss of about £2,000. Indeed I am fully convinced by my own experience, added to that of almost all who have tried the extraction of copper by purely chemical wet processes, that such processes are not applicable in practice.

I next turned my attention to the fact that the large copper smelters in South Wales and elsewhere, were then, as they are at this moment, throwing out into the atmosphere, as to them an utterly useless product, the sulphurous acid gas which the chemist is so anxious to get cheaply; and that in quantities that would more than meet all the demands of the staple chemical manufactures. I asked myself whether I could not avail myself of this sulphur, which cost nothing and had no value to the smelter. The first difficulty was a mechanical one. All the pyrites then used in chemical works (whether Irish, Belgian, or Spanish) was imported in large masses, which were broken up into fragments of from 1 to 5 cubic inches in size. From these the sulphurous acid was extracted by combustion in kilns somewhat similar in construction to small limekilns; but before charging the pyrites into these kilns all the dust or small had to be sifted out, as otherwise it would choke or damp the draught of the kilns, and prevent combustion.

When, however, attention was directed to the ores used by the copper smelters, it was found that all the ores sold in Cornwall, and nearly all those imported, were crushed up before being sent to market; and that in fact the smelter used only small ores. Now no method was then known by which these small ores could practically be calcined so as to economise the sulphur; for though repeated experiments had been made, at great expense, by the large copper-smelting firms to calcine their ores in such a way as to condense the sulphur, all such attempts had ended in failure—so much so that all endeavours on their part to effect this object have been abandoned.

To prove that such is the case I take the liberty of giving an extract from the evidence given by Dr. Percy before Lord Derby's Committee on noxious vapours.

Lord Derby—The statement of Le Play, that 46,000 tons of sulphur are annually lost, only goes to this, that if there were any known means of preventing the evolution of that sulphur, there would be a saving to that extent?

Dr. Percy—Undoubtedly, if it could be collected economically, it would be an advantage to the copper smelters.

Lord Derby—You are not prepared to say that it could be.

Dr. Percy—I am not prepared to say that it can, by any known method. I am acquainted with all the attempts which have been made to obviate this nuisance—for a nuisance it undoubtedly is—but I believe they have not been found effective.

Lord Derby—What, in your opinion, is the reason why it is impossible to condense, or in any way to dissipate, this vapour?

Dr. Percy—I do not say that it is impossible at all; all I say is that I know of no method, at present in existence, whereby it can be completely and economically condensed.

One of the attempts probably referred to by Dr. Percy was a furnace used by a Lancashire copper smelter, chiefly for producing arsenic from the copper ores, but partially used for the production of sulphuric acid from these ores. While my attention was directed to the subject of copper ores as a source of sulphur, a friend of mine in Manchester got the plans, and erected one of these furnaces, which were called "dummy" furnaces. At his request, I saw it while building, and without hesitation said it would be a failure, which it turned out to be; for after being used for a few months, it was pulled to pieces, its fallacious principle becoming apparent. This being then considered the best thing hitherto tried for the purpose, I at once determined to attempt the erection of a furnace on what I considered sound chemical principles. The furnace I erected was successful in calcining the small ores with a small expenditure of fuel and labour, with elimination of all the sulphur if that was required; and enabling me to send all the sulphur so eliminated into the vitriol chamber, as sulphurous acid gas. Very soon after, I erected additional furnaces; and all the sulphuric acid made at my works at Manchester and at Goole, since the end of 1861, has been made from these small ores, treated in furnaces, similar, with slight modifications, to the first one I erected. Besides other parties who are using them, I have now eight calcining furnaces at work, and am using from 125 to 180 tons of ore per week; and, in fact, am doing exactly what Dr. Percy stated he knew no method in operation that was capable of doing—for all the ores used are precisely the same ores as those used by the copper

smelters. I buy them in Cornwall, at the same market as the copper smelter—paying only for the copper, the sulphur not being of any value to the smelter, who would rather have his ores nearly without it, if he could so get them.

The amount of sulphur wasted in copper smelting, and which could be economised by the use of calcining furnaces similar to those used by myself, is something enormous. Le Play, who many years ago investigated the subject with great care, gave the ores then used at 4,000 tons per week, and the sulphur in them as averaging 23%. The quantity now used exceeds 5,000 tons per week, which (by the result of many analyses made in my own laboratory) contain on an average 28% of sulphur. This gives 70,000 tons of sulphur per annum, which at the present price of brimstone (£6 10*s.* per ton) gives a money value of £455,000. This, however, is hardly a fair way of putting it, as sulphuric acid is more cheaply made from pyrites than from brimstone. But from the 250,000 tons of copper ore now used annually by the smelters, 200,000 tons of brown sulphuric acid (of spec. grav. 1·75) could be produced—for I am actually making acid at that rate from these ores. This acid sells at from £3 10*s.* to £4 per ton; but at the very low estimate of £2 per ton, its cost price to the maker, the smelters are actually throwing away £400,000 a year. Now, whatever may have been the position of the copper smelter a few years ago, he is at the present time wasting all this sulphur when there is not the slightest difficulty in economising nearly the whole of it as sulphuric acid, without at all interfering with the smelting processes.

As I quoted the evidence of Dr. Percy as to his then knowing no method by which this could be accomplished, I am happy to have his authority for stating that he is of a different opinion since he has seen my furnaces in operation. He says—"I believe that not only may a large proportion of the sulphurous acid of the copper smelters be collected and applied to the manufacture of sulphuric acid, without in any way interfering with the usual system of copper smelting at Swansea and elsewhere in this country, but that such collection and application would be of considerable gain. All that is required to effect this important object is to replace the ordinary copper calcining furnaces by furnaces similar to those I have seen in Mr. Spence's works. The copper smelter would hardly be conscious of the innovation, except from the abatement of the nuisance from his smoke, and, if I do not greatly err, from the improvement of his balance-sheet."

This I have authority to give as Dr. Percy's present opinion. Now, apart from the question of nuisance, I warn the copper smelters that a change is inaugurating that will swallow up their business unless they take the bull by the horns and become chemical manufacturers. They can and ought to make all the sulphuric acid required at a merely nominal cost; and if they decline, then the chemical manufacturers will inevitably become copper smelters. To the present profits of copper smelting they will, in addition, be able to make the sulphuric acid they require for next to nothing.

Now it may seem a gratuitous piece of kindness in me thus to

warn the copper smelter, when I say that I am actually entering into his business. I, along with some other chemists, have had an experiment in smelting going on for twelve months, and so far with success. We have overcome the great difficulty of the smelter—the making of a clean slag. This we have effected by using a special flux, so that our slag contains, on an average, only from ·25% to ·3% while Le Play gives, as the result of 58 samples of the Swansea slag, ·5% of copper.* I have also put into operation within the last month a new arrangement by which a very considerable economy in fuel and labour will be effected, and which brings the purely smelting part of the operation into more immediate connection with the chemical or sulphuric acid making stage of the business. The copper smelter in calcining his ores does so in an ordinary reverberatory furnace. The ore is spread over the bed, the flame from the fire playing over its surface; so that the gases from the ore meet with the coal smoke, and, both ascending the chimney together, form a white volume, traceable, it has been said, for 20 miles from Swansea. When calcined, the ore is raked out of the furnace into an arch below; and, after cooling (by drenching with water) is removed to the ore smelting furnace, into which it is generally dropped through a hole in the centre of the arch.

In my process, the calciner (*See* Plate I., Figs. 1 and 2) which has been in use in my works for three years, has a flat bed for the ore 40′ long by from 6′ to 9′ in breadth. Under this bed, the fire flues traverse nearly the whole length of the furnace, to which furnace, however, the fire itself has no access. The ore is charged on to one end of this furnace bed every two hours, in charges of from 5 to 8 cwts.; and, after two hours, is transferred, by iron paddles or slices, to some distance from the point where it was first charged; being replaced by another charge. This transferrence goes on every two hours, until the ore reaches the other end of the furnace—where, being fully calcined, it is dropped into an iron truck and removed. This charging and transferrence goes on periodically, air being continuously drawn in at the part of the furnace where the burnt ore falls out; which air, traversing the whole surface of the ore on the bed, and, effecting combustion, ultimately arrives at the other end highly charged with sulphurous acid gas, and passes up a special flue or chimney into the vitriol chambers. Nitrous gas is, as usual, found mixed with it as it enters the chamber. This process goes on day and night; and the furnaces are so regularly kept at the same temperature that their wear is exceedingly small—one having been at work upwards of two years, with only three days' stoppage for repairs.

The new modification before referred to, which is now at work (*See* Plate I., Fig. 3) consists in combining the calcining furnace with the smelting furnace, so that the ore falls out of the calciner into the smelter at a red heat—thus saving the labour and

* In explanation of this I may say that the copper smelter is chiefly anxious about the quality of the article he throws away—his first, or ore-furnace slag—the great point being that all the copper shall be in the regulus, and little or none in the slag.

nuisance of removal, and the cost of reheating it when put cold into the smelter. In addition to this, the waste heat from the smelter, instead of passing direct to the stack, is made to pass under the bed of the calcining furnace, thus saving all the fuel now used in calcining—a very considerable item in the total fuel required. These compound-furnaces, which are shown in Fig. 3, have now been at work for some weeks, and the success is quite satisfactory, clean slag and good regulus being daily produced. A little alteration in detail may possibly be required, but in principle their success is established.

British Association for the Advancement of Science.

THIRTY-FOURTH MEETING, AT BATH.

THIS meeting of the Association opened on September 14th, under the presidency of Sir Charles Lyell, Bart., LL.D., D.C.L., F.R.S. Although highly successful as far as numbers were concerned, in general interest it fell far beneath its Newcastle predecessor. It was not, of course, to be expected that Bath could approach Newcastle in exhibiting objects of industrial interest, or in inviting papers bearing on the application of Science to industrial purposes; but no attempt was made to make the most of the resources of this kind within reach. The next meeting of the Association will be held at Birmingham, under the presidency of Professor John Phillips, of Oxford.

THE PRESIDENT'S ADDRESS.

SIR CHARLES LYELL opened his address with a disquisition on the Bath waters and their Geological conditions—more particularly in their relation, and those of thermal springs generally, to volcanic action. Pursuing this comparison between the hot spring and the volcano, Sir Charles considers that—"we may regard the water of the spring as representing those vast clouds of aqueous vapour which are copiously evolved for days, sometimes for weeks, in succession from craters during an eruption. But we shall perhaps be asked whether, when we contrast the work done by the two agents in question, there is not a marked failure of analogy in one respect—namely a want, in the case of the hot spring, of power to raise from great depths in the earth voluminous masses of solid matter corresponding to the heaps of scoriæ and streams of lava which the volcano pours out on the surface. To one who urges such an objection it may be said that the quantity of solid as well as gaseous matter transferred by springs from the interior of the earth to its surface is far more considerable than is commonly imagined. The thermal waters of Bath are far from being conspicuous among European hot springs for the quantity of mineral matter contained in them in proportion to the water which acts as a solvent; yet Professor Ramsay has calculated that if the sulphates of lime and of soda, and the chlorides of sodium and magnesium and the other mineral ingredients which they contain, were solidified, they would form in one year a square column 9 feet in diameter, and no less than 140 feet in height. All this matter is now quietly conveyed by a stream of limpid water, in an invisible form, to the Avon, and by the Avon to the sea; but if, instead of

being thus removed, it were deposited around the orifice of eruption, like the siliceous layers which encrust the circular basin of an Icelandic geyser, we should soon see a considerable cone built up, with a crater in the middle; and if the action of the spring were intermittent, so that ten or twenty years should elapse between the periods when solid matter was emitted, or (say) an interval of three centuries, as in the case of Vesuvius between 1306 and 1631, the discharge would be on so grand a scale as to afford no mean object of comparison with the intermittent outpourings of a volcano.

"Dr. Daubeny, after devoting a month to the analysis of the Bath waters in 1833, ascertained that the daily evolution of nitrogen gas amounted to no less than 250 cubic feet in volume. This gas, he remarks, is not only characteristic of hot springs, but is largely disengaged from volcanic craters during eruptions. In both cases he suggests that the nitrogen may be derived from atmospheric air, which is always dissolved in rain-water, and which, when this water penetrates the earth's crust, must be carried down to great depths so as to reach the heated interior. When there, it may be subjected to deoxidating processes, so that the nitrogen, being left in a free state, may be driven upwards by the expansive force of heat and steam, or by hydrostatic pressure. This theory has been very generally adopted, as best accounting for the constant disengagement of large bodies of nitrogen, even where the rocks through which the spring rises are crystalline and unfossiliferous. It will, however, of course be admitted, as Professor Bischof has pointed out, that in some places organic matter has supplied a large part of the nitrogen evolved.

"Carbonic-acid gas is another of the volatilised substances discharged by the Bath waters. Dr. Gustav Bischof, in the new edition of his valuable work on chemical and physical geology, when speaking of the exhalations of this gas, remarks that they are of universal occurrence, and that they originate at great depths, becoming more abundant the deeper we penetrate. He also observes that, when the silicates which enter so largely into the composition of the oldest rocks are percolated by this gas, they must be continually decomposed, and the carbonates formed by the new combinations thence arising must often augment the volume of the altered rocks. This increase of bulk, he says, must sometimes give rise to a mechanical force of expansion capable of uplifting the incumbent crust of the earth; and the same force may act laterally so as to compress, dislocate, and tilt the strata on each side of a mass in which the new chemical changes are developed. The calculations made by this eminent German chemist of the exact amount of distension which the origin of new mineral products may cause, by adding to the volume of the rocks, deserve the attention of geologists, as affording them aid in explaining those reiterated oscillations of level—those risings and sinkings of land—which have occurred on so grand a scale at successive periods of the past. There are probably many distinct causes of such upward, downward, and lateral movements, and any new suggestion on this head is most welcome; but I believe the expansion and contraction of solid rocks, when they are alternately heated and cooled, and the fusion and subsequent consolidation of mineral masses, will continue to rank, as heretofore, as the most influential causes of such movements.

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"If we adopt the theory already alluded to [that of Dr. Daubeny] that the nitrogen is derived from the deoxidation of atmospheric air carried down by rain-water, we may imagine the supply of this water

to be furnished by some mountainous region, perhaps a distant one, and that it descends through rents, or porous rocks, till it encounters some mass of heated matter by which it is converted into steam, and then driven upwards through a fissure. In its downward passage the water may derive its sulphate of lime, chloride of calcium, and other substances from the decomposition of the gypseous, saline, calcareous, and other constituents of the rocks which it permeates. The greater part of the ingredients are common to sea-water, and might suggest the theory of a marine origin; but the analysis of the Bath springs by Merck and Galloway shows that the relative proportion of the solid matter is far from agreeing with that of the sea, the chloride of magnesium being absolutely in excess, that is, 14 grains of it per gallon for 12 of common salt; whereas in sea-water there are 27 grains of salt, or chloride of sodium, to 4 of the chloride of magnesium. That some mineral springs, however, may derive an inexhaustible supply, through rents and porous rocks, from the leaky bed of the ocean, is by no means an unreasonable theory, especially if we believe that the contiguity of nearly all the active volcanos to the sea is connected with the access of salt water to the subterrranean foci of volcanic heat.

"Professor Roscoe, of Manchester, has been lately engaged in making a careful analysis of the Bath waters, and has discovered in them three metals which they were not previously known to contain—namely, copper, strontium, and lithium; but he has searched in vain for cæsium and rubidium, those new metals, the existence of which has been revealed to us in the course of the last few years by what is called spectrum analysis.

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"Professor Bunsen, of Heidelberg, led the way, in 1860, in the application of this new test to the hot waters of Baden-Baden and of Dürkheim in the Palatinate. He observed in the spectrum some coloured lines of which he could not interpret the meaning, and was determined not to rest till he had found out what they meant. This was no easy task, for it was necessary to evaporate fifty tons of water to obtain 200 grains of what proved to be two new metals. Taken together, their proportion to the water was only as one to three million. He named the first cæsium, from the bluish-grey lines which it presented in the spectrum; and the second rubidium, from its two red lines. Since these successful experiments were made, thallium, so called from its green line, was discovered in 1861, by Mr. Crookes; and a fourth metal named indium, from its indigo-coloured band, was detected by Professor Richter, of Freiberg, in Saxony in a zinc ore of the Hartz. It is impossible not to suspect that the wonderful efficacy of some mineral springs, both cold and thermal, in curing diseases, which no artificially prepared waters have as yet been able to rival, may be connected with the presence of one or more of these elementary bodies previously unknown; and some of the newly found ingredients, when procured in larger quantities, may furnish medical science with means of combating diseases which have hitherto baffled all human skill.

"While I was pursuing my inquiries respecting the Bath waters, I learned casually that a hot spring had been discovered at a great depth in a copper mine near Redruth in Cornwall, having about as high a temperature as that of the Bath waters, and of which, strange to say, no account has yet been published.* It seems that, in the year

* It is scarcely necessary, in a mining periodical, to point out the extraordinary error into which Sir Charles Lyell had been led in stating this thermal

1839, a level was driven from an old shaft so as to intersect a rich copper-mine at the depth of 1,350 feet from the surface. This lode or metalliferous fissure occurred in what were formerly called the United Mines, and which have since been named the Clifford Amalgamated Mines. Through the contents of the lode a powerful spring of hot water was observed to rise, which has continued to flow with undiminished strength ever since. At my request, Mr. Horton Davey of Redruth, had the kindness to send up to London many gallons of this water, which have been analysed by Professor William Allen Miller, F.R.S., who finds that the quantity of solid matter is so great as to exceed by more than four times the proportion of that yielded by the Bath waters. Its composition is also in many respects very different; for it contains but little sulphate of lime, and is almost free from the salts of magnesium. It is rich in the chlorides of calcium and sodium, and it contains one of the new metals—cæsium, never before detected in any mineral spring in England: but its peculiar characteristic is the extraordinary abundance of lithium, of which a mere trace had been found by Professor Roscoe in the Bath waters; whereas in this Cornish hot spring this metal constitutes no less than a twenty-sixth part of the whole of the solid contents, which, as before stated, are so voluminous. When Professor Miller exposed some of these contents to the test of spectrum analysis, he gave me an opportunity of seeing the beautiful bright crimson line which the lithium produces in the spectrum.

"Lithium was first made known in 1817 by Arfvedsen, who extracted it from petalite; and it was believed to be extremely rare, until Bunsen and Kirchhoff, in 1860, by means of spectrum analysis, showed that it was a most widely diffused substance, existing in minute quantities in almost all mineral waters, and in the sea, as well as in milk, human blood, and the ashes of some plants. It has already been used in medicine, and we may therefore hope that, now that it is obtainable in large quantities, and at a much cheaper rate than before the Wheal-Clifford hot spring was analysed, it may become of high value. According to a rough estimate which has been sent to me by Mr. Davey, the Wheal-Clifford spring yields no less than 250 gallons per minute, which is almost equal to the discharge of the

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water never to have been before described. In a subsequent explanation of this error, Sir Charles stated that he had received from Mr. W. J. Henwood, F.R.S., a communication pointing out a great oversight inadvertently made in his (Sir Charles's) inaugural address—namely, in the statement that they had no published scientific account of the Wheal Clifford hot springs. He was first informed of the existence of this spring by Dr. Percy, who referred him to Mr. Warington Smyth, the result of whose two visits to Redruth, and whose observations on the spring in 1855 and 1864 he had referred to in his address. Unable to learn from these gentlemen, or from his friend, Dr. Daubeny, that any account had been printed of this "hot lode," he wrote to Mr. Horton Davey, who was unable to obtain for him, after speaking to the miners of Redruth, any reference to published *data* on the subject. He had now found that so long ago as the year 1819, in the Reports of this Association, Mr. R. W. Fox had given notice of the temperature (76° Fahr.) of the water when the mine was 170 fathoms deep, and that subsequent observations by him, by Mr. Henwood, and by Mr. Francis, between the years 1838 and 1857, had been published in the *Cornwall Geological Transactions*, and in their own British Association Reports, closing with a notice by Mr. Fox, of the temperature reaching 160°, at the depth of 255 fathoms, in the year 1857. Mr. Fox had detected the chlorides of calcium and sodium, but it remained for Professor Miller to discover cæsium, and that large and extraordinary amount of lithium, which gives to the solid contents of this spring their peculiar character.

King's Bath, or chief spring of this city. As to the gases emitted, they are the same as those of the Bath water—namely, carbonic acid, oxygen, and nitrogen.

"Mr. Warington Smyth, who had already visited the Wheal-Clifford lode in 1855, re-examined it in July last, chiefly with the view of replying to several queries which I had put to him; and, in spite of the stifling heat, ascertained the geological structure of the lode, and the exact temperature of the water. This last he found to be 122° Fahr. at the depth of 1,350 feet; but he scarcely doubts that the thermometer would stand two or three degrees higher at a distance of 200 feet to the eastward, where the water is known to gush up more freely. The Wheal-Clifford lode is a fissure varying in width from 6 to 12 feet, one wall consisting of elvan or porphyritic granite, and the other of killas or clay-slate. Along the line of the rent, which runs east and west, there has been a slight throw or shift of the rocks. The vein-stuff is chiefly formed of cellular pyrites of copper and iron, the porous nature of which allows the hot water to percolate freely through it. It seems, however, that in the continuation upwards of the same fissure little or no metalliferous ore was deposited, but, in its place, quartz, and other impermeable substances, which obstructed the course of the hot spring, so as to prevent its flowing out on the surface of the country. It has been always a favourite theory of the miners that the high temperature of this Cornish spring is due to the oxidation of the sulphurets of copper and iron, which are decomposed when air is admitted. That such oxidation must have some slight effect is undeniable; but that it materially influences the temperature of so large a body of water is out of the question. Its effect must be almost insensible; for Professor Miller has scarcely been able to detect any sulphuric acid in the water, and a minute trace only of iron and copper in solution.

"When we compare the temperature of the Bath springs, which issue at a level of less than 100 feet above the sea, with the Wheal-Clifford spring found at a depth of 1,350 feet from the surface, we must of course make allowance for the increase of heat always experienced when we descend into the interior of the earth. The difference would amount to about 20° Fahr., if we adopt the estimate deduced by Mr. Hopkins from an accurate series of observations made in the Monkwearmouth shaft, near Durham, and in the Dukinfield shaft, near Manchester, each of them 2,000 feet in depth. In these shafts the temperature was found to rise at the rate of only 1° Fahr. for every increase of depth of from 65 to 70 feet. But if the Wheal-Clifford spring, instead of being arrested in its upward course, had continued to rise freely through porous and loose materials so as to reach the surface, it would probably not have lost anything approaching to 20° Fahr., since the renewed heat derived from below would have warmed the walls and contents of the lode, so as to raise their temperature above that which would naturally belong to the rocks at corresponding levels on each side of the lode. The almost entire absence of magnesium raises an obvious objection to the hypothesis of this spring deriving its waters from the sea; or if such a source be suggested for the salt and other marine products, we should be under the necessity of supposing the magnesium to be left behind in combination with some of the elements of the decomposed and altered rocks through which the thermal waters may have passed.

"Hot springs are, for the most part, charged with alkaline and other highly soluble substances, and, as a rule, are barren of the precious metals, gold, silver, and copper, as well as of tin, platinum, lead,

and many others, a slight trace of copper in the Bath waters being exceptional. Nevertheless there is a strong presumption that there exists some relationship between the action of thermal waters and the filling of rents with metallic ores. The component elements of these ores may, in the first instance, rise from great depths in a state of sublimation or of solution in intensely heated water, and may then be precipitated on the walls of a fissure as soon as the ascending vapours or fluids begin to part with some of their heat. Almost everything, save the alkaline metals, silica, and certain gases, may thus be left behind long before the spring reaches the earth's surface. If this theory be adopted, it will follow that the metalliferous portion of a fissure, originally thousands of feet or fathoms deep, will never be exposed in regions accessible to the miner until it has been upheaved by a long series of convulsions, and until the higher parts of the same rent, together with its contents and the rocks which it had traversed, have been removed by aqueous denudation. Ages before such changes are accomplished thermal and mineral springs will have ceased to act; so that the want of identity between the mineral ingredients of hot springs and the contents of metalliferous veins, instead of militating against their intimate relationship, is in favour of both being the complementary results of one and the same natural operation.

"But there are other characters in the structure of the earth's crust more mysterious in their nature than the phenomena of metalliferous veins, on which the study of hot springs has thrown light—I allude to the metamorphism of sedimentary rocks. Strata of various ages, many of them once full of organic remains, have been rendered partially or wholly crystalline. It is admitted, on all hands, that heat has been instrumental in bringing about this re-arrangement of particles, which, when the metamorphism has been carried out to its fullest extent, obliterates all trace of the imbedded fossils. But as mountain-masses many miles in length and breadth, and several thousands of feet in height, have undergone such alteration, it has always been difficult to explain in what manner an amount of heat capable of so entirely changing the molecular condition of sedimentary masses could have come into play without utterly annihilating every sign of stratification, as well as of organic structure.

"Various experiments have led to the conclusion that the minerals which enter most largely into the composition of the metamorphic rocks have not been formed by crystallizing from a state of fusion, or in the dry way, but that they have been derived from liquid solutions, or in the wet way—a process requiring a far less intense degree of heat. Thermal springs, charged with carbonic acid and with hydrofluoric acid (which last is often present in small quantities), are powerful causes of decomposition and chemical reaction in rocks through which they percolate. If, therefore, large bodies of hot water permeate mountain-masses at great depths, they may, in the course of ages, superinduce in them a crystalline structure; and, in some cases, strata in a lower position and of older date may be comparatively unaltered, retaining their fossil remains undefaced, while newer rocks are rendered metamorphic. This may happen where the waters, after passing upwards for thousands of feet, meet with some obstruction, as in the case of the Wheal-Clifford spring, causing the same to be laterally diverted so as to percolate the surrounding rocks. The efficacy of such hydro-thermal action has been admirably illustrated of late years by the experiments and observations of Sénarmont, Daubrée, Delesse, Scheerer, Sorby, Sterry Hunt, and others.

"The changes which Daubrée has shown to have been produced by the alkaline waters of Plombières, in the Vosges, are more espe-

cially instructive. These thermal waters have a temperature of 160° Fahr., and were conveyed by the Romans to baths through long conduits or aqueducts. The foundations of some of their works consisted of a bed of concrete made of lime, fragments of brick, and sandstone. Through this and other masonry the hot waters have been percolating for centuries, and have given rise to various zéolites—apophyllite and chabazite among others; also to calcareous spar, arragonite, and fluor spar, together with siliceous minerals, such as opal,—all found in the interspaces of the bricks and mortar, or constituting part of their re-arranged materials. The quantity of heat brought into action in this instance in the course of 2,000 years has, no doubt, been enormous, although the intensity of it developed at any one moment has been always inconsiderable.

"The study, of late years, of the constituent parts of granite has, in like manner, led to the conclusion that their consolidation has taken place at temperatures far below those formerly supposed to be indispensable. Gustav Rose has pointed out that the quartz of granite has the specific gravity of 2·6, which characterises silica when it is precipitated from a liquid solvent, and not that inferior density, namely 2·3, which belongs to it when it cools and solidifies in the dry way from a state of fusion.

"But some geologists, when made aware of the intervention on a large scale, of water, in the formation of the component minerals of the granitic and volcanic rocks, appear of late years to have been too much disposed to dispense with intense heat when accounting for the formation of the crystalline and unstratified rocks. As water in a state of solid combination enters largely into the aluminous and some other minerals, and therefore plays no small part in the composition of the earth's crust, it follows that, when rocks are melted, water must be present, independently of the supplies of rain-water and sea-water which find their way into the regions of subterranean heat. But the existence of water under great pressure affords no argument against our attributing an excessively high temperature to the mass with which it is mixed up. Still less does the point to which the melted matter must be cooled down before it consolidates or crystallizes into lava or granite afford any test of the degree of heat which the same matter must have acquired when it was melted and made to form lakes and seas in the interior of the earth's crust.

"We learn from Bunsen's experiments on the Great Geyser in Iceland, that at the depth of only 74 feet, at the bottom of the tube, a column of water may be in a state of rest, and yet possess a heat of 120° Centigrade, or 248° Fahr. What, then, may not the temperature of such water be at the depth of a few thousand feet? It might soon attain a white heat under pressure; and as to lava, they who have beheld it issue, as I did in 1858, from the south-western flanks of Vesuvius, with a surface white and glowing like that of the sun, and who have felt the scorching heat which it radiates, will form a high conception of the intense temperature of the same lava at the bottom of a vertical column several miles high, and communicating with a great reservoir of fused matter, which, if it were to begin at once to cool down, and were never to receive future accessions of heat, might require a whole geological period before it solidified. Of such slow refrigeration hot springs may be among the most effective instruments, abstracting slowly from the subterranean molten mass that heat which clouds of vapour are seen to carry off in a latent form from a volcanic crater during an eruption, or from a lava-stream during its solidification. It is more than forty years since Mr. Scrope, in his work on volcanos, insisted on the important part which water plays in an erup-

tion, when intimately mixed up with the component materials of lava, aiding, as he supposed, in giving mobility to the more solid materials of the fluid mass. But when advocating this igneo-aqueous theory, he never dreamt of impugning the Huttonian doctrine as to the intensity of heat which the production of the unstratified rocks, those of the plutonic class especially, implies.

"The exact nature of the chemical changes which hydrothermal action may effect in the earth's interior will long remain obscure to us, because the regions where they take place are inaccessible to man; but the manner in which volcanos have shifted their position throughout a vast series of geological epochs—becoming extinct in one region and breaking out in another—may, perhaps, explain the increase of heat as we descend towards the interior, without the necessity of our appealing to an original central heat or the igneous fluidity of the earth's nucleus."

The next portion of the Address was occupied by a discussion of the great variations in temperature that may have been brought about, during various geological epochs, by changes in the physical relations of the land and sea forming the surface of our globe. The subject has long been a favourite one with Sir Charles Lyell; and his arguments, on the present occasion, only went to strengthen and enforce the views already expressed in his *Principles of Geology*. After illustrating by an anecdote how "fettered we have been by old traditional beliefs" in taking liberal views of the extent of geological time; he concluded his address by alluding to the gradual change that has been taking place in the minds of geologists with respect to the once popular theories as to the succession of events in the organic and inorganic world having been interrupted by violent and general catastrophes. He especially illustrated this by the recent discovery made by the Canadian geological survey of numerous fossils in the Laurentian rocks—rocks the newest of which underlie, unconformably, the representatives of the so-called primordial rocks of this country.

THE SECTIONS.

The meetings of the Sections commenced, as usual, on the Thursday, the 15th. The number of the papers in many of the Sections were very numerous—too numerous, indeed, for the time available; which in many cases, unfortunately, necessitated the hasty abridgement of the papers themselves, and the limitation of all discussion. In the Geological, Chemical, and Mechanical Sections the pressure was particularly heavy—many papers in each being hurried over, and some even left unread. No matters immediately within our subjects were brought before any Sections except Section B (Chemical), Section C (Geological), and Section F (Economical Science), except certain very interesting photographs, showing the structure of iron and steel, exhibited by Mr. H. C. Sorby, F.R.S., at Section G (Mechanical). The list of papers within our range read at Sections B, C, and F, were as follows:—

SECTION B.—CHEMICAL SCIENCE.

President:—W. Odling, M.B., F.R.S., F.C.S.

Vice-Presidents:—Sir B. C. Brodie, Bart., F.R.S.; C. G. B. Daubeny, M.D., F.R.S.; J. H. Gladstone, Ph.D., F.R.S.; W. A. Miller, M.D., V.P.R.S.; A. W. Williamson, Ph.D., F.R.S.

Secretaries:—Professor Liveing, M.A., F.C.S.; A. Vernon Harcourt, M.A., F.C.S.; Robert Biggs.

1. *Dr. Gladstone.*—Report of the Committee on the application of Gun Cotton.

2. *Dr. Miller.*—On the Analysis of a hot spring containing Lithium and Cæsium in Wheal Clifford.

3. *Dr. Paul.*—Note on some of the constituents of the Oil known as Crude Parafin Oil.

4. *F. Crace Calvert, F.R.S., F.C.S.*—On a new method of extracting Gold from Auriferous Ores.

5. *Fredk. Field.*—On a specimen of Tin Ore hitherto undescribed.

6. *P. Spence.*—On Copper Smelting.

7. *Dr. Machattie.*—On the presence of Nickel in Metallic Lead.

8. *Professor W. B. Rogers.*—An account of apparatus and processes for the chemical and photometrical testing of Illuminating Gas.

9. *Dr. Paul.*—On useful applications of slag from iron smelting.

10. *Wentworth Scott.*—On some probable new sources of Thallium.

11. *Dr. Williamson.*—On Isomorphism.

12. *Professor W. B. Rogers.*—To exhibit the inventions of Mr. Cornelius, of Philadelphia, for lighting gas burners by electricity.

13. *Alfred Noble.*—Remaur's Porcelain.

Section C.—Geology.

President:—J. Phillips, M.A., F.R.S., F.G.S., Professor of Geology in the University of Oxford.

Vice-Presidents:—Sir W. Logan, F.R.S.; Earl of Enniskillen, F.R.S.; Professor Harkness, F.R.S.; W. Sanders, F.R.S.; Rev. W. Symonds, F.G.S.; Professor Rogers.

Secretaries:—H. C. Sorby, F.R.S.; W. Pengelly, F.R.S.; W. B. Dawkins, F.G.S.; J. Johnston.

1. *W. Sanders*—A brief explanation of a Geological Map of the neighbourhood of Bristol and Bath.

2. *H. C. Salmon.*—On the Geognostic relations of the auriferous quartz of Nova Scotia.

3. *Dr. Daubeny.*—On the cause of the extrication of Carbonic Acid from the interior of the earth, and on its chemical action upon the constituents of Felspathic Rocks.

4. *W. Keene.*—On the Coal Measures of New South Wales.

5. *J. Mackenzie.*—On the New South Wales Coal Field.

6. *J. Randell.*—On the Position in the Great Oolite, and the Mode of Working, of the Bath Freestone.

7. *Preliminary Report of the Committee.*—On the Distribution of the Organic Remains of the North Staffordshire Coal field.

8. *W. W. Smyth.*—On the Thermal Water of the Clifford Amalgamated Mines of Cornwall.

9. *A. Bassett.*—On the South Wales Mineral Basin.

Section F.—Economic Science and Statistics.

President:—William Farr, M.D., D.C.L., F.R.S.

Vice-Presidents:—Sir John Bowring, F.R.S.; James Heywood, F.R.S.; the Mayor of Bath; Right Hon. Joseph H. Napier; Col. W. Sykes, M.P., F.R.S.

Secretaries:—Frederick Purdy, Edmund Macrory, and E. T. Payne.

1. *James Heywood*—Report of a Committee of the British Association, on Uniformity of Weights and Measures.

2. *Edward Spender.*—On the "Truck-system" in some parts of the West of England.

3. *Handel Cossham.*—Statistics of the Coal Trade: Colliers employed, Wages paid, and Social Condition of the Miners employed in the Northern portion of the Bristol Coal-Field.

MAP OF THE BRISTOL COAL-FIELD.

Mr. W. Sanders, in explaining a large map of the district, stated that it was constructed by reducing about 220 parish maps to the scale of 4 inches to the mile, or 20 chains to the inch. Being coloured in accordance with those of the Government survey, it presents the general features of a coal basin, the boundaries of which are well-defined on all sides except the eastern. Some tracts of limestone project from the western border, and nearly the whole of the interior is occupied by strata of Mesozoic age. Exterior to the northern boundary, Silurian strata appear, and on the east and south the country is covered by strata of the lower and middle divisions of the Mesozoic or secondary system. On the extreme south-eastern corner a small tract of the green-sand formation is seen. Thus, the map comprises a large portion of the geological series, ranging from the lower Silurian up to the lower division of the Cretaceous system. With respect to the coal strata, as the deposits of a later age occupy a large portion of the country, only one-half of the coal strata of the northern part of the basin, and only a tenth or twentieth part of the southern part is visible at the surface. The northern tract is about 12 miles in length, with a breadth of three or four miles. The Nailsea coal-field is of smaller dimensions. The Clutton coal-pits are in a central position. A southern coal-field adjoins the Mendip hills. The Radstock pits, which yield an abundant supply of excellent quality, are entirely concealed beneath Liassic and even Oolitic strata. The Coal-measures proper have a thickness of about 5,000 feet, divisible into an upper and lower series of coal seams, separated by the Pennant Grit rocks. They contain about 90 feet of coal, of which about one-half is workable.

NEW SOURCES OF THALLIUM.

In a paper read before the Chemical section of the British Association, Professor W. L. Scott stated that some time back, during the examination of a fine, but highly ferruginous, sand, obtained from the neighbourhood of Whitby, it struck him as remarkable that a certain precipitate, which he knew to be entirely free from both barium and copper, should tint a hydrogen flame green. On going into the matter somewhat more carefully he found that this precipitate exhibited the thallic spectrum very distinctly. From this he was led to examine other sands; amongst them, those from Alum Bay, I.W., and some others. As is well known, the Alum Bay sand-clays present very great variation, both in structure and colour, the latter occasioned by small and varying quantities of several metallic oxides; organic matter on these sands he has frequently found to contain thallium, often in no inconsiderable quantity, of which he exhibited some small specimens, both of the sands and of the metal obtained therefrom. The general plan adopted was to precipitate the mixed metals as sulphides, after fusing the sands with caustic or carbonates of the alkalies, or in the usual way; then to redissolve the precipitate in acid, add acetate of sodium and tartaric acid to retain the iron, and finally throw down the thallium present as oxide by potassa. On reduction, the thallium was obtained in a state of purity sufficient for all ordinary purposes. The sands containing the thallium are the rock sands, the sea-shore sand, as a rule, contain no thallium. Many of the deeply-coloured clays, which alternate with the sands at Alum Bay, also give indications, more or less marked, of containing thallium.

APPLICATION OF IRON SLAG.

In Dr. Paul's paper on this subject, he stated that attempts had been made to cast the slag into blocks as it issued from the furnace, to be afterwards used as artificial stone, but had all failed. The application proposed with slag at the present time was to convert it into bricks for building. This was done by a simple and ingenious contrivance. A gentleman had succeeded in blowing the slag into a state of very fine division, by sending steam or air into it, just as it flowed from the blast furnace in the liquid state. It was thus blown into a substance resembling wool in appearance. This substance was taken and ground into dust, mixed with lime, subjected to powerful pressure, and made into bricks, of which he exhibited some examples. These bricks required no fire: after being pressed, they were allowed to dry, and could be used at once, the influence of the atmosphere producing a slow kind of hardening.

Abstracts and Reviews.

GEOLOGY OF CALIFORNIA.

We have, on various occasions, referred to the progress of the Geological Survey of California, under the direction of Professor J. D. Whitney, State Geologist. Professor Whitney, who has recently returned East to superintend the preparation of the survey publications, has contributed to the last (September) number of Silliman's *American Journal of Science and Arts* a short paper, in which he states a few of the facts already determined by the survey.

In addition to the work carried on within the boundaries of the State of California, observations (not considered or paid for by the State) have been extended into the adjacent territories of Oregon and Washington, and also into Vancouvers Island, by Mr. Gabb. This gentleman has also now joined an exploring party through south-eastern Oregon. Mr. Clarence King has explored some portions of the Nevada Territory; and Mr. Rémond has been for some time in Sonora and Mexico. Unconnected with the survey, Baron Richthofen, an eminent Austrian Geologist, has been engaged in investigating the geology of the Pacific coast—especially devoting himself to the Washoe region. On the whole, therefore, Professor Whitney has reason to hope that the labours of the past three years, and the coming four, for which appropriation has been already made by the State Legislature, can hardly fail to furnish the means of giving a tolerably approximate geological map of the Pacific coast.

One of the most interesting facts observed in the topographical survey of the Sierra Nevada was the proofs, everywhere observable, of the former existence of glaciers on a scale of unsurpassed magnitude. Thousands of acres of granite retain the most exquisite glacial polish, and the existence of lateral, medial, and terminal moraines are as easily observed as in the Alps of the present day. Ice nearly 1,000 feet in thickness must once have flowed through the Tuolumne Valley.

Perhaps the most striking result of the survey is the proof obtained of the immense development on the Pacific side of the American Continent of rocks equivalent in age to the Upper Trias of the Alps, and

paleontologically allied to the limestones of the Hallstadt and Aussee, and the St. Cassian beds. Sufficient evidence has been already obtained to show that this great Triassic belt (which in latitude 40° has been explored by the survey over a width from east to west of four degrees of longitude, 117° to 121°) extends from Mexico to British Columbia. It is usually highly metamorphosed, and much broken up, interrupted, and covered by volcanic and eruptive rocks.

Accompanying this Triassic formation in the Sierra Nevada, and probably also in the Humboldt ranges, is an extensive development of Jurassic rocks, usually highly metamorphosed and extremely barren of fossils. Enough of the latter have, however, been found to justify the assertion that *the sedimentary portion of the great metalliferous belt of the Pacific coast of North America is chiefly made up of rocks of Jurassic and Triassic age*, with a comparatively small development of Carboniferous Limestone. *Not a trace of a Devonian or Silurian fossil has ever been discovered in California, or indeed anywhere west of the 116th meridian.* So much for the long fashionable theory that all auriferous rocks are older than the Carboniferous; as far as California is concerned, so far from gold being limited to Silurian rocks, *this metal occurs in no inconsiderable quantity in metamorphic rocks of as recent age as the Cretaceous.**

Indeed, rocks of Cretaceous age are very wide-spread in California. The coast-ranges in that State and in Oregon are, indeed, to a large extent made up of rocks of this age—usually more or less metamorphic, and often highly so—all, as far as yet known, only represented by a single member, the upper, or white chalk. Rocks of Tertiary age are also extensively developed in the coast ranges, although not to the same extent as the Cretaceous.

In regard to the relative ages of the different mountain chains, there can be no doubt that the Sierra Nevada is older than the Rocky Mountain chain. The great mass of the Sierra was uplifted and metamorphosed after the termination of the Jurassic epoch, and prior to the deposition of the Cretaceous, for the latter is found resting horizontally on the flanks of the Sierra all through Central California. The same is probably true with regard to the ranges east of the main Sierra, which there is also reason to believe were uplifted and metamorphosed after the close of the Jurassic period; although there is not yet positive evidence of this having taken place prior to the Cretaceous period. With respect to the coast-ranges, they show three distinct periods of upheaval. The main one, at the close of the Cretaceous period; the next after the deposition of the Miocene; and a third, which seems to have commenced during the later Pliocene, which is still going on. It is an interesting fact with regard to these

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* A comparison between these facts, and the popular gold theories set forth by Sir R. Murchison, are a most instructive example of the danger of hasty generalisation on insufficient data. The following extract from *Siluria* gives the pith of Sir Roderick's theories:—

"Gold has never been found in any appreciable quantity in either of the two last mentioned [secondary and tertiary] classes of strata. The vast areas, therefore, which are covered by all the formations younger than those whose relations we have been considering [*i.e.*, the Paleozoic rocks] are excluded from the application of our reasoning; and everyone who lives amidst such rocks *may at once be assured that he can never profitably extract gold from them* . . . . . Whether referring to past history . . . or to those chains in America and Australia which, previously unsearched, have, in our time, proved so rich, we invariably find the same constants in nature. In all these lands, gold has been imparted abundantly to the *ancient rocks* ONLY, or their associated eruptive rocks."—pp. 431-2.

ranges, that the exterior ones—that is, those nearest the Pacific—are older geologically than the interior ones bordering the Sacramento and San Joaquin valleys. This, Professor Whitney remarks, is a repetition, on a smaller scale, of what has occurred in the formation of the whole continent—the exterior lines were first marked out, and the interior filled up afterwards.

As to the detrital deposits, which are so extensively worked by hydraulic and tunnel mining, Professor Whitney considers there is no subject connected with the geology of the Pacific coast in regard to which there are so many misapprehensions. It has been assumed that they are of marine origin, and that they originally extended over the whole western slope of the Sierra Nevada. The real facts are entirely different. In the first place, it has been clearly proved that they are not of marine origin. Again, they are not distributed over the flanks of the Sierra in such a way as they would have been if they had resulted from the action of the sea. On the contrary, there is every reason to believe that they consist of materials brought down from the mountain-heights above, and deposited in pre-existing valleys, sometimes in very narrow accumulations, like the simple beds of ancient rivers; and at other times in wide expansions, like the beds of former lakes; the whole probably due to causes similar (in kind) to those now existing, but of greater intensity. The deposition of this detritus, for the most part auriferous, took place during the later Pliocene epoch, and not so recently as the drift or diluvial period.

This deposition of auriferous detritus was succeeded, throughout the whole extent of the Sierra Nevada, by a tremendous outbreak of volcanic energy, which first covered the detritus with heavy accumulations of volcanic sediments (ashes, pumice, and the like), and finally wound up by a general outpouring of lava, flowing from the summits of the Sierra through the valleys over the river and lake-like expansions of auriferous detritus—covering the latter under hundreds of feet of an almost indestructible material.

Since this volcanic outburst, and since the commencement of the present geological epoch, all this has however been changed, and the topography of the country has become exactly the reverse of what it was at the termination of the volcanic epoch. What were once valleys are now ridges, and the ridges of former times were where the immense cañons of the rivers are now. By the effect of subsequent denudation, the detrital gravel and overlying volcanic materials, instead of occupying depressions on the surface, are found forming high plateaux between the present river cañons and the flat-topped ridges known as table mountains, hundreds, or even thousands, of feet above the present river beds.

From this short sketch it will be seen what subjects of varied interest are opened up by the investigation of this noble country. We may congratulate ourselves that it has fallen into such able hands as those of Professor Whitney.

MINING STATISTICS OF SPAIN FOR 1862.

We have again to express our great obligation to our esteemed correspondent, Señor Don José de Monasterio, the eminent Spanish Government Mining Engineer, for the following statistics of the produce of the mines and smelting works of Spain, and of the produce and value of the Government mines, salt-works, and smelting establishments, for the year 1862.

I.—PRODUCTIVE MINES.

Number of Productive Mines.	Area of Surface in Metres.	Number of Workmen.	Steam Engines.	Horse Power.	Quantity of Ores produced in Metrical Quintals.															
					Iron.	Lead.	Silver.	Copper.	Tin.	Zinc.	Quicksilver.	Cobalt.	Antimony.	Manganese.	Soda.	Alum.	Sulphur.	Coal.	Peat.	Asphaltum.
1,286	128,997,385·15	31,800	52	1,342	2,131,121	2,778,450	25,237	2,277,192	1,013	411,042	161,153	27	847	64,598	50,217	81,423	126,315	3,602,456	286,961	11,961

II.—SMELTING AND CHEMICAL WORKS.

Number of Smelting Works.	Number of Workmen.	Hydraulic Engines.	Steam Engines.	Horse-power.	Furnaces.									Products in Metrical Quintals											
					High.	Blast.	Reverberatory.	Refineries.	Catalan.	Cupolas.	For Steel.	For Quicksilver.	Pattinson's Pots.	Iron.		Steel.	Lead.	Silver (Kilogrammes).	Copper.	Tin.	Zinc.	Quicksilver.	Soda.	Alum.	Sulphur.	Asphaltum.
														Cast.	Wrought.										
486	10,875	402	132	2,673	50	446	331	85	307	19	21	30	53	481,062	410,683	1,621	627,679	13,759·54	28,892	51	18,834	7,695	28,050	2,252	24,444	2,246

III.—PRODUCE OF THE GOVERNMENT MINES.

Name of the Works.	Province.	Class of Ore.	Quantity Extracted. Metrical Quintals.	Number of Workmen.	Products Obtained. Nature.	Products Obtained. Metrical Quintals.	Number of Workmen.	Value in Reales Vellon.	Value in £ Sterling.
Almaden	Ciudad Real	Sulphide of Mercury	113,266	2,443	Quicksilver	7,401	292	13,884,276	
Ríotinto	Huelva	Copper Pyrites	861,945	797	Copper	13,113	376	10,179,744·10	
Linares	Jaén	Sulphide of Lead	33,573	150	Lead	25,769	78	3,752,840·71	
Hellin	Albacete	Sulphur	—	—	Sulphur	2,058	699	479,734·36	
Sundry Works	—	Salt	1,350,286	—	Salt	1,882,025	—	118,554,757	
		Total						146,851,352·17	1,529,701

The money value of this produce, both in the raw state as ores and minerals, and in the smelted or refined state as metals or merchantable articles, has been as follows, showing a grand total of 3,770,833*l.*

Ores and Minerals.			Metals and other Substances produced.		
		Reales Vellon.			Reales Vellon.
Iron Ores..... tons	213,192·1	6,928,743·25	Iron, pig .....tons	48,106	28,863,720
Lead..... „	277,845	84,548,233·50	„ wrought. „	41,068	69,816,110
Silver ..... „	2,523·7	6,183,435	Steel ..... „	162·1	421,460
Copper..... „	227,719·2	20,563,043·76	Lead ..... „	62,767·9	87,875,060
Tin ..... „	100·3	222,860	Silver ...kilogrames	13,759·54	11,282,822·80
Zinc ..... „	41,104·2	10,687,092	Gold .....grames	7,660	99,580
Quicksilver..... „	16,115·3	9,185,721	Copper .....tons	2,889	22,540,440
Cobalt ..... „	2·7	4,644	Tin ..... „	5·1	83,130
Antimony ..... „	84·7	42,350	Zinc ..... „	1,883	3,201,780
Manganese ..... „	6,459·8	968,970	Quicksilver ... „	769·5	14,435,820
Soda ..... „	5,021·7	251,085	Soda ..... „	2,805	1,683,000
Alum ..... „	8,142·3	325,692	Alum ..... „	225·2	180,160
Sulphur ..... „	12,639·5	2,022,320	Sulphur..... „	2,444·4	2,982,168
Asphaltum ..... „	1,166·1	151,593	Asphaltum..... „	224·6	89,840
Topaz .....cwts.	10	9,322·50			
Coal ....tons	360,245·6	19,813,508	Total		243,555,090·80
Peat ..... „	28,696·1	1,291,324·50	Value of Salt sold by the Government.....		118,554,757
Total		163,199,937·51	Grand Total		362,109,847·80 or £3,770,833.

Extracts, Notes, and Memoranda.

MINING AND QUARRYING.

PNEUMATIC ELEVATOR FOR MINE SHAFTS.—Messrs. Alison and Shaw propose to dispense with the use of ropes and chains in mine shafts, and to employ in their place an apparatus somewhat similar in form to that introduced by the Pneumatic Despatch Company, but which is worked by pressure instead of exhaustion. The inventors state that in their elevators, which are equally applicable for raising either water or minerals from collieries and mines, a cylinder is placed in the shaft, which rises a few feet above the top of the shaft, and reaches a few feet below the bottom of the mine. This cylinder is made of malleable or cast-iron, and of a diameter according to the weight of minerals, water, or other substances to be lifted. In this cylinder a double-headed piston works, and between the two heads of the piston a receiver is placed, which holds the mineral or water to be raised. An air-pump, worked by a steam-engine or water-wheel, or other power, is used for forcing air down the shaft in a tube, which air passes into the cylinder below the under piston-head. Forcing only may be used, but exhausting and forcing may be used in conjunction. When the load is put in at the bottom, a valve is opened, so that the air is introduced under the piston, which, with its load, then rises to the top. On arriving at the top the load is removed, and on an escape-valve at the bottom being opened, the piston descends, and the air which escapes ventilates the mine. This ventilator not

only acts as an elevator and ventilator, but provides a mode of conveyance for the workmen up and down the shaft.

SAFETY LAMPS WITH DOUBLE GAUZES.—Mr. Rees, of Merthyr Tydvil, proposes to furnish the safety lamp with two cylinders of wire gauzes, concentric with each other and with the flame. At the top of each cylinder is a perforated disc of metal to protect them from the direct action of the heat of the lamp. The oil reservoir is provided with a false bottom, a little above the true one, and these communicate with each other by an opening in the false bottom. From this opening a tube, perforated to about half way up, extends through the oil reservoir. A rod, passing through the gauze cylinders, enters this tube, its end screwing into the opening in the false bottom, by which means communication between the two chambers is cut off. Before the gauze cylinders can be removed it is necessary to unscrew this rod, and when this is done the oil will pass rapidly from the oil reservoir to the lower chamber, so that the lamp wick being no longer supplied with oil the flame will be quickly extinguished. Mr. Rees also proposes to protect the flame of the lamp in front by two concentric curved or semi-cylindrical glasses, and at the back by wire gauze.

AN IMPROVED BLASTING POWDER.—Herr Nobel, of Stockholm, proposes to increase the effectiveness of the ordinary blasting powder by the addition of nitro-glycerine. This nitro-glycerine is a very clear oily fluid, which ignites at about 170° C. (338° Fahr.), but it burns very slowly and with a crackling noise. It is only in combination with the ordinary powder that the nitro-glycerine developes a very considerable strength, and this combination is at least from 3 to 5 times stronger than ordinary gun- or blasting-powder.

GOLD WASHER AND SEPARATOR.—Mr. Hicks, of New York, has patented a machine, which, by the peculiar motion given to it, settles the gold to the bottom of the separator, and, at the same time, prevents its becoming packed with ores. In nearly all mining districts there is a good deal of gold so fine and flat that it is impossible to save much of it by the usual methods. The upper portion of this machine is a section of a common sluice, with the bottom perforated, through which the water, the smaller particles of gravel, &c., with the gold, pass; while the coarser matters go down the sluice. The matter that passes through the bottom of the sluice falls into a rectangular pan, having an opening in the centre, through which it passes upon the centre of the separator below; this separator is circular, and designed to be kept level by the shaft through it. The upper end of the shaft runs in a bar, which can be moved in any direction, whereby the separator can be kept level without disturbing the frame. The centre of the separator is depressed, forming a circular pan, into which the matter from the rectangular pan falls; this peculiarity of the centre of the separator is designed to equalise the distribution of the dirt and the water to all points of the circumference. From the centre it is slightly declining. Next to the plane, outwardly, and forming the circumference of the separator, is a semicircular depression. By the action of the gearing attached to the frame the separator receives a combined reciprocal, horizontal, rotary, and shaking motion, which settles the gold in the outward depression, or pan. The idea is to settle the gold into the depression by the motion of the separator, while the sweep of the water from the centre of the separator to the circumference, combined with the tangential or centrifugal force given to lighter matter, results in the separation and retention of the gold in the outward depression, or pan. Where water is scarce the

inventor proposes that the section of the sluice may be closed up at each end, making a box into which the dirt can be put and washed; the box should move on four rollers, two attached to each side-bar of the frame. Where no water can be had, the tangential or centrifugal force given by the motion of the separator, coupled with the elevation of the centre, is of itself sufficient to separate the dirt from the gold, provided the dirt be thoroughly dried and pulverised. The amount of fall necessary to run one of these machines, with 20 feet of sluice to wash the dirt, is but 20 inches, while it can be run with 10 inches of fall and the same amount of sluicing, by setting the machine 10 inches below the surface.

Winding Apparatus for Collieries.—Messrs. Dentonand Whitaker, of Leeds, propose some improvements in the apparatus used for winding cages in mines and collieries, the objects being to prevent the descent of the cage by the accidental breaking of the rope, and to prevent accident from over-winding. The ropes coupled to the main rope, and supporting the cage, are attached to two catches, working loose on studs fixed to each end of the upper part of the cage, which is drawn up and let down the pit by the upright conductor. The catches have curved slots cut in them from the centres of the studs; each slot contains a curved block of less length than the slot, so that when the suspending chains are tightened by the weight of the cage the catches will turn on their centres, the points of the catches opening or descending until the bottom of each slot comes in contact with the bottom of its block, four of which form the bearing of the cage. A spring is bolted to each block ready to bring the points of the catches back to the conductor; when the rope slackens or breaks, these springs act upon projecting headed studs near the points of the catches. Curved plates (bolted to the back of the blocks with the springs between the two) serve as parallel guides for the catches. To prevent accidents from over-winding a C link is employed with the bend or hook very strong; a guard prevents the ring of the rope from slipping off the hook. The guard has two snecks, over which two catches drop to keep the guard in position. The catches are held down by two springs bearing on the studs, the ring and guard being jointed at the bottom. The two catches are coupled together by a tail piece inserted between them, so that should the cage be over-wound. before it can reach the pulley, the tail piece will come in contact with a cross beam fixed for the purpose, and turning on a pivot set in the link, the catches will be lifted from the sneck, thereby removing the impediment to the separation of the guard from the link, which, having the shoulder on it above the tail piece, will be thrown backwards, so that the rope ring must slip out and leave the catches and the cage behind, then the catches in the cage itself being released from the pull of the rope spring into action against the conductor, and prevent the descent of the cage.

METALLURGY AND CHEMICAL MANUFACTURES.

"Superheating" the Hot Blast for Iron Furnaces.—After the blast for iron furnaces has been heated by any of the ordinary methods, Mr. B. Samuelson proposes to "superheat" it, which may be effected in apparatus arranged like the ordinary heating stoves. The blast is on no account allowed to come into direct contact with fuel because of the absorption of oxygen which it involves.

IMPROVEMENTS IN PUDDLING FURNACES.—Mr. M. J. Davies, of Ohio, proposes so to form the inner surfaces of the boshes that they will serve to hold up in place and prevent the falling down of a protecting composition or layer. The boshes of ordinary boiling or puddling furnaces are commonly made of cast-iron, inclined and smooth on their inner or fire surfaces, and so constructed and set in surrounding fire-brick that a current of cold air circulates under the locks of the plates composing the boshes, and prevents them from becoming melted. As a further preventive against the destruction of the boshes, it is common to "fix" or protect the boshes by placing against them a layer of iron ore in lumps, while a layer of iron scraps is placed upon the bottom or hearth. The ore and scraps are then partially proved, and form a protection for the boshes and bottom, under the intense heat to which they are exposed during the subsequent process of boiling or puddling. The ordinary fixing or preparing of the furnace to receive a charge for puddling is a work of much labour, requires from two to three hours' time, and involves the consumption of a considerable quantity of fuel. This improvement overcomes the above difficulties, dispenses with and saves the time, labour, and expense of the usual fixing, and the attendant losses of fuel, ore, scrap iron, &c. For this purpose the inside faces of the boshes are constructed with a series of step-like ridges, recesses, or corrugations, which serve to hold or retain a protecting composition, which is thrown upon the said ridges, recesses, or corrugations, and the hearth, preparatory to charging the furnace. The protecting compound is composed of lime, ore-clay, iron ore, tap cinder, and iron scales. But any other suitable protecting medium or compound may be employed.

RETORTS AND FURNACES FOR DISTILLING COAL AND PEAT.—According to Mr. Baker's method, the retorts are constructed of two hollow cylinders of iron of unequal diameters, the smaller one being fixed concentric or nearly concentric within the larger one. The ends of the inner hollow cylinder are open, and annular ends connect the outer and inner cylinders together. The retort thus made has the general figure of a Cornish steam boiler, or a cylindrical steam boiler with a central flue. The furnace by which the retort is heated is constructed in the front part of the central flue, and the flame and heated air are made to pass from the central flue along the lower sides of the retort to the front or furnace end, and from thence along the upper sides of the retort to the chimney. By this construction of the retort its contents, which are distributed in a layer of a tubular form, are very uniformly heated, heat being applied on both sides of the layer. It is provided with an opening at the upper part of its front end for charging, and with one at the lower part of its front end for discharging. The inner and outer cylindrical surfaces of the retort may be coated with fire-brick for the purpose of moderating and regulating the heating.

EXTRACTION OF AURIFEROUS SILVER IN THE LIQUID WAY.—In extracting alloys of gold and silver from ores by the wet method, the difficulty has been to separate the two completely. This may be arrived at by a process now proposed, which is to roast and lixiviate the ore with a solution of concentrated common salt, saturated with chlorine, when both metals will be simultaneously precipitated.

IMPROVED REVERBERATORY FURNACE.—Mr. E. B. Wilson has patented a furnace on the reverberatory principle, in which, the flame, after producing its effect on the bed, passes downward under the floor to

the stack. The fire-space, also, is without fire-bars, and the fuel is supplied in such a manner that the whole of the gases are supposed to be utilised, and entirely consumed before passing to the chimney. This fire-space is a suitably formed chamber of refractory material, provided transversely in the centre with a hanging bridge, the bridge between the fire-space and the bed occupying the ordinary position. After the fire is lighted the portion of the fire-space on the outer side of the hanging bridge is kept well supplied with coal; so that the air required for combustion must pass through the interstices of the cold fuel before it can reach the burning fuel, and consequently the whole of the gases given off while the fuel is warming are utilised. As the system of burning is that of a downward draught, and as the fuel is introduced at the furthest point from the chimney, the surface of the fire on the drawing side is at all times in an incandescent state, so that every particle of heat acts upon the bed, and the iron is heated with the cleanest possible flame. It is proposed to apply this invention to puddling furnaces, where a clean flame has a material effect upon the quality of the iron produced.

Production of Hydrocarbon and other Oils.—In order to produce these oils Earl Dundonald proposes to combine the substances to be operated upon with sulphuric acid, or other suitable oxidising body, as sesqui-oxide of iron, in a retort or still. Superheated steam or hot-air is then applied in sufficient quantity and of such a temperature as will cause all the volatile products to distill over: the degree heat varies from 100° to 400° Fahr., according to the substance operated on, and the ultimate product required from 100° to 400° Fahr., and the volatile products are collected in the ordinary manner. By thus combining the raw material with an oxidising agent, and distilling them in combination, an increased quantity of oils is obtained, and of greater purity. The quantity of sulphuric acid, or other oxidising body employed, varies from 2 to 10 per cent.

Manufacturing Peat and Peat Charcoal.—Mr. J. J. Hays has patented some improvements in the manufacture of these articles, in which the apparatus employed in the first stage consists of a grinding-mill, formed of discs of cast-iron, fixed vertically in a frame, and having the surfaces ribbed or grooved either radially or spirally. The improvements also relate to a kiln for drying, to retorts for carbonising peat, and to the condensation and collection of the tar and other products derived from peat.

Lubricating Matter from Peat.—Mr. H. Caunter, of the Isle of Lewis, proposes to extract a lubricating matter by the combination of caustic soda with the tar, crude oil, or grease resulting from the distillation of peat, in the proportions of about 3 gallons of alkaline solution to 1 cwt. of distilled product.

Manufacture of Chlorine.—Mr. de Tregomain has patented an invention which relates to improvements in the manufacture of chlorine by means of bichlorides, and also to the method of revivifying the latter. After the bichloride, which is heated to a deep red, has disengaged about half its chlorine, and has changed to a state of protochloride, it is collected, while in a state of fusion, and poured on marble slabs, and then ground in a mill. The powder obtained is introduced into a revivifying apparatus, in which is passed a current of air of sufficient amount, when the protochloride in powder, in coming in contact with the oxygen of the air, becomes changed into oxychloride, or mixture of binoxide and bichloride of copper. In

order to effect the revivification, the powdered oxychloride is placed in stoneware vessels, containing hydrochloric acid in the proportion of about 1 cwt. of dry oxychloride to 100 lbs. of acid. The matters are then heated, cooled, and crystallised, and the mother waters drawn off, the crystals being dried and distilled over again.

MISCELLANEA.

NORTH OF ENGLAND INSTITUTE OF MINING ENGINEERS.—The monthly meeting of the members of this Institute was held at Newcastle, on September 3rd, Mr. T. E. Foster, vice-president, in the chair. A short discussion on Messrs. N. Wood and E. F. Boyd's paper on the "wash" through the Durham coal field took place. The discussion was introduced by some additional observations forwarded by the president, Mr. N. Wood. In the concluding part of this paper it was suggested that a committee should be appointed, or that the council should undertake the task of collecting all the sinkings through the superficial deposits from all the collieries of the district, so that a correct record might be obtained of these deposits of clay, sand, &c., which would be very useful both for practical and scientific purposes. As the Ordnance Survey gives the levels, Mr. Wood thought that a very complete account of the boulder clay deposits at different localities might be obtained.

ROYAL CORNWALL POLYTECHNIC SOCIETY.—The 32nd exhibition of this Society commenced at Falmouth on September 7th. The mechanical department is stated to have been more than usually extensive. Among the mining apparatus exhibited the most important were:—I.—Vivian's roller guides for stamp lifters, the advantages of which are stated to be a lessening of friction and consequent saving of power; a facility in changing the lifts, and thereby effecting, in case of accident, a considerable saving in time and labour; and lastly, greater durability in both guide and lifter; the whole resulting in a saving of cost, the first outlay being about the same as for the ordinary guides. II.—A safety exploring lamp by Mr. S. Higgs, jun., of Penzance. III.—A hand-boring machine by a working miner of Hayle. IV.—An appliance for lifting water and sand, or pulverised ores, from the stamp's feet, by means of the Archimidean screw, by Mr. E. Borlase. V.—Mr. Crease's boring machine.

MINER'S ASSOCIATION OF CORNWALL AND DEVON.—A general meeting of the members of this Association was held at Falmouth, on September 8th, Mr. J. J. Rogers, M.P., in the chair. Mr. Robert Hunt, F.R.S., reported that the progress of the Association was satisfactory, after which the following papers were read:—"On the Surface Indications of Mineral Deposits," by a member of the Helston Class; and on the "Influence of Lodes on Rocks," by Mr. R. Pearce.

The following articles are in type, but are excluded by pressure on our space:—The Metallurgical Processes of the Mansfeld Copper Works—Dudley and Midland Geological Society—Fairbairn on the Application of Iron—New Method of Extracting Gold from Auriferous Ores, by Crace Calvert, F.R.S.—Increase of Volume of Rocks, by Dr. Daubeny—Statistics Relative to the Bristol Coal-Field, by Handel Cossham—Mode of Working the Bath Freestone, by J. Randall—Remaur's Porcelain, by A. Noble—The Geological Magazine.

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BITTSANSZKY.—Ueber Gold und Silber-Extraction. (Berg-Geist, Nos. 60, 61, 62.)

BRUNNER.—Reduktion des Chlorsilbers. (Dingl. J., Bd. 171.)

CAILLETET.—Durchdringlichkeit des Schmiedeeisens für Gase bei hoher Temperatur. (Dingl. J., Bd. 172, S. 357.)

CARON.—Einfluss eines Zusatzes von Wolframmetall zu Geschützbronze, Gusseisen und Stahl. (Dingl. J., Bd. 172, S. 43.)

CLERK.—Formveränderung rothglühender Metalle beim Eintauchen in Wasser. (Dingl. J., Bd. 171.)

CORDELLA, A.—Ueber eine neue Gesteinbildung oder alluviales Schlackenconglomerat. (Berg- und Hütten. Zeit., No. 35.)

DIEKMANN, E.—Ueber den Einfluss der Schachtlage auf die Ausgewinnung der Steinkohlenfelder. (Berg-Geist, Nos. 73 and 74.)

DULLO.—Ueber einige neue Vorrichtungen bei der Torffabrikation. (Dingl. J., Bd. 172, S. 331.)

FREIBERGER SCHMELZHÜTTEN.—Ueber die bei den Freiberger Schmelzhütten zur Abwendung von Hüttenrauchschäden getroffenen Vorkehrungen. (Im. Auszuge aus Polytechn. Centr. 1864, S. 589.)

GALIBERT.—Galibert's Respirations-apparat um in verdorbene Grubenluft eintreten zu können. (Berg- und Hütten. Zeit., No. 37.)

GERARD, L.—Exploitation du Sel dans les Alpes de Salzbourg. (Revue Univ., 8th Ann., 3rd liv.)

GESTEINSARBEIT.—Freie unbeschränkte Gedinge bei der Gesteinsarbeit. (Oesterr. Zeitschrift, No. 18, 1864.)

GRUNDMANN.—Vergleichung englischer und schlesischer Steinkohlen. (Breslau, 1864.)

GUSSEISEN.—Ueber hämmerbares Gusseisen. (Berg- und Hütten. Zeit., No. 36.)

HULL, E.—On the Copper-bearing Rocks of Alderley Edge, Cheshire. (Geolog. Mag., August.)

HUNDT'SCHEN TRICHTERHERD.—Versuche mit dem auf dem Oberharze verbesserten Hundt'schen Trichterherd im Vergleich zu dem Stossherde. (Berg- und Hütten. Zeit., No. 34.)

HUNT, T. STERRY.—Contributions to Lithology. (Silliman's Amer. Journ., July.)

HUYSSEN, A.—Die allgemeine Verhältnisse des Preussichen Bergwesens, mit Rücksicht auf ihre Entwickelung. (Essen, 1864.)

JENZSCH, Dr.—Ueber die felsitischen Gemengtheile der rothen und jüngeren grauen Gneisse. (Berg- und Hütten. Zeit., No. 37.)

JOSSA, H. VON.—Ueber die Produktion von Gold, Kupfer und Eisen in den Krons-Berg-und Hüttenwerken des Uralgebirges in den Jahren 1860 und 1861. (Berg-und Hütten. Zeit., Nos. 32, 33.)

KLOSTERMANN, R.—Uebersicht der bergrechtlichen Entscheidungen des Königlichen Obertribunals, 1860-1863. (Berlin, 1864.)

KUPFFERSCHLAEGER, I.—Analyses et Essais docimastiques. Minerais de Plomb. (Revue Univ., 8th Ann., 3rd liv.)

LATDORF.—Die Braunkohlenmulde bei Latdorf. (Ztschr. d. Vereins deutscher Ingenieure, 1864, Heft. 7.)

LEA, M. C.—Notes on the Platinum Metals, and their separation from each other. (Silliman's Amer. Journ., July.)

MEYER, L.—Reinigung des Quecksilbers. (Fresenius Ztschr. f. analyt. chem., 2 Jahrg.)

MINENSPRENGEN.—Das Minensprengen bei Tagebauen. (Oester. Zeitschrift, No. 22, 1864.)

MITTENTZWEY, M.—Volumetrische Eisenprobe. (ERDM. J. f. prakt. Chem., Bd. 91.)

MOHR.—Titrirprobe für Eisen. (Fresenius' Ztschr. f. analyt. Chemie, II. Jahrg., S. 243.)

NEUENDAHL, L. VON.—Neuerungen beim Blei- und Silber-hüttenbetriebe zur Friedrichshütte bei Tarnowitz. (Berg- und Hütten. Zeit., Nos. 36.)

OBERHARZE.—Vollendung des Ernst-August-Stollnn am Oberharze. (Berg- und Hütten. Zeit., No. 33.)

PELTZER AND GREINER.—Exploitation et Traitement du Schiste cuivreux argentifrère au Mansfeld. (Revue Univ., 8th Ann., 3rd liv.).

PHIPSON, DR. T. L.—Presence of the New Metal Thallium in Pyrolusite.—The New Metal Cæsium a Constituent of Pollux.—The Mineral Schorlomite in Europe.—The Mineral Riches of Roumania. (Geolog. Mag., August and September.)

POUMAREDE.—Rösten der Silbererze mit Kochsalz. (Polyt. Centrbl. 1864.)

PRUSSIA.—Produktion der Bergwerke, Salinen und Hütten in dem Preussischen Staate im Jahre, 1862. (Berg- und Hütten. Zeit. No. 30.)

PUDDELSTAHL.—Puddelstahl aus oberschlesischen Holzkohlen und Cokesroheisen. (Ztschr. d. oberschl. Berg- und Hüttenm.- Vereins, 1864, No. 11.)

RATH, G. VON.—Quecksilbergrube zu Vallalta in den venetianischen Alpen. (Ztschr. d. deutsch. geol. Gesellsch., XVI, 121.)

RESCH, E.—Ueber das Rohmaterial zu einem vorzüglichen Gussstahl. (Oesterr. Zeitschrift, No. 15, 1864.)

—— Beiträge zu den Erfahrungen über Brennstoff und Schmelztiegel bei der Gussstahlmanipulation. (Oesterr. Zeitschrift, No. 24, 1864.)

SAARBRÜCKEN.—Die französischen Steinkohlengruben in der Nähe von Saarbrücken. (Berg-Geist, Nos. 66, 67.)

SAIGERUNG VON OBERHARZER SCHWARZKUPFERN.—Vergleichung der Saigerung von Oberharzer Schwarzkupfern mit deren Auflösung in verdünnter Schwefelsäure. (Berg- und Hütten. Zeit., No. 31.)

SANTA DOMINGO.—Resultados de la explotacion de la mina cobriga de Santa Domingo en Portugal, referentes al año de 1863. (Revista Minera, No. 340.)

SCHAFHÄUTL, DR.—Ueber Veränderungen der Eisenbleche in der Glühhitze unter Einwirkung von Stichflammen und Wasser, nebst Bemerkungen über Puddel- und Herdfrischeisen. (Kunst- und Gewerbebl. des polyt. Vereins f. d. Könige. Bayern. Juni, 1863.)

SCHEERER. Zusammensetzung der Kieselsäure. (Erdm. J. pr. Chem. Bd. 91.)

SIEMENS.—Siemens' Gussstahlschmelzofen. (Berg- und Hütten. Zeit., No. 31.)

SILLIMAN, B., jun.—On the so-called "Barrel Quartz" of Nova Scotia. (Silliman's Amer. Journ., July.)

SMYTH, PROF.—Lectures on Mining, at the Royal School of Mines. The Dressing of Ores. (Min. Journal, July 30.)

STADLER.—Zinktitriung bei mangan- und bleihaltigen Erzen. (Erdm. J., Bd. 91, S. 318.)

STAHLSCHMIDT, J. H.—Darstellung des Eisenhohofenprozesses in Zahl und Bild, verwendet zur Begründung besserer Ofenprofile. (Hagen, 1864.)

SULLIVAN AND O'REILLY.—Notes on the Geology and Mineralogy of the Spanish Province of Santander. (8vo. London and Edinburgh.)

TURLEY. B.—Salzausblühen im Torf. (Berg- und Hütten. Zeit., No. 32,)

UNTERHARZ.—Produktion des Bergwerks- und Hüttenbetriebes bei den Communion- Unterharzischen Werkenfür das Jahr 1863. (Berg- und Hütten. Zeit., No 31.)

VANADIN.—Vorkommen des Vanadins. (Erdm. J. f. prakt. Ch. Bd. 91.)

WENKENBACH, F.—Bergmännisches Wörterbuch. (Wiesbaden, 1864.)

WILLIAMS, S. W.—Notes on a Cave and Coal Pit near Peking. (Silliman's Amer. Journ., July.)

YATES.—Verbessertes Verfahren bei der Anfertigung von Panzerplatten. (Polyt. Centr. 1864, S. 581.)

Patents relating to Mining and Metallurgy.

(Compiled from Commissioners of Patents' Journal.—Subject matter only given.)

UNITED KINGDOM.

Application for Patents from Aug. 30th. to Sept. 21st.

2,126 (1864). J. Lones, Coating iron with steel.
2,162 (1864). W. W. Burdon, Apparatus for getting coal.
2,175 (1864). J. K. Leather (com. from B. Margulies), Manufacture of salts of chromium from chrome ore.
2,229 (1864). R. F. Fairlie, Manufacture of artificial fuel.
2,237 (1864). Z. S. Duffee, Applying gaseous fuel to metallurgical operations.
2,269 (1864). C. Attwood, Blast-furnaces.
2,276 (1864). J. H. Johnson (com. from P. Baudet), Artificial fuel.
2,278 (1864). F. Yates (com. from Dr. A. Gurlt), Manufacture of iron and steel.
2,282 (1864). J. H. Burns, Distillation of volatile minerals.
2,293 (1864). T. Taylorson, Machinery for working coal or other minerals.
2,294 (1864). R. A. Brooman (com. from E. Aubertin), Manufacture of phosphuret of iron, phosphate of lime, and alkaline phosphates.
2,304 (1864). W. P. Struvé, Manufacture of slabs or blocks of malleable iron.
2,313 (1864). I. Baggs and W. Simpson, Manufacture of chlorine.
2,318 (1864). T. A. Rochussen, Construction of crucibles, and furnaces for melting metals in crucibles.

Patents Sealed from Sept. 8th. to Sept. 16th.

784 (1864). H. Smith, and E. Roberts, Breaking stones and minerals.
1,786 (1864). J. Clayton, Furnaces for melting iron and steel.

Patents on which duty has been paid from Aug. 3rd to Sept. 17th.

1,975 (1861). G. H. Bovill, Manufacture of armour and other plates of wrought-iron. [50*l.*]
2,900 (1861). G. Parry, Manufacture of iron and steel. [£50]
2,350 (1857). E. Lavender, Distilling products from coal. [£100]
2,339 (1861). E. Breffit, An improved fuel. [£50.]

Patents Void by non-payment of duty from July 23rd to Sept. 3rd.

1,863 (1861). W. Longmaid, Manufacture of iron.
1,945 (1861). M. A. F. Mennons (com. from A. Grisard-Vanzuylen), Improvements in the grates of reverberatory and other metallurgic furnaces.
1,983 (1861). J. Hemingway, Machinery for working coal and ironstone.
2,024 (1861). E. Edwards, Machinery for separating minerals, ores, and coal from impurities.
2,031 (1861). J. Bethell, Manufacture of crucibles and pots for chemical and smelting purposes from steatite.
2,230 (1857). F. A. Gatty, Manufacture of chlorine and sulphuric acid.
2,234 (1857). P. G. Gardiner, Treatment of cast steel.
2,142 (1861). B. Browne (com. from H. E. Roeder), Concentrating ores or tailings, or separating pulverised mineral substances.
2,197 (1861). G. Bischof, junr. (com. from Dr. G. Bischof, sen.), Extracting copper and silver.

AUSTRIA.

Patents Delivered, Prolonged, and become Void during February.

253. R. Flechner, Refining nickel-speiss containing iron and cobalt. [Delivered.]
257. J. Fitz, A spring borer for blasting operations. [Delivered.]

267. T. Richard, A peculiar system of mantle furnaces. [Delivered.]
180. E. Guignet, Manufacture of hydrate of chromium. [Prolonged.]
174. G. Bischof, Extracting copper from sulphuretted and other copper ores without acids. [Become void.]
178. H. F. Toussaint and L. N. Langlois, Separating gold and silver ores and other metals. [Become void.]
184. J. Tittelbach, Conglomerating coal residues into cakes. [Become void.]
217. A. Hopfgartner, A combined re-heating and puddling furnace. [Become void.]
219. C. G. Müller, Conglomerating coal and brown coal, peat and coke. [Become void.]

BELGIUM.

Patents Delivered from Aug. 1st. to Sept. 15th.

16,464. A. Smith, A blast-engine, applicable as a motor, counter, or pump.
16,486. C. Sanderson, Manufacturing armour plates.
16,503. L. S. A. Duchemin, Cementing and inoxidating iron and steel.
16,568. Wirth and Sonntag, Furnaces for smelting metals and ores.
16,588. F. C. Armelin, Conglomerated fuel.
16,613. J. Webster, Manufacturing zinc.
16,630. F. Seebohm, Using ferruginous pyrites in manufacture of pig-iron.
16,640. J. Clayton, Reverberatory and other furnaces.
16,670. A. Dumas and C. Benoit, A fluorescent lamp for miners.
16,671. F. M. M. and P. Martin, Manufacturing cast-steel.
16,710. A. A. de Rostaing, Refining and separating metals.
16,717. J. Williams and G. Bedson, Puddling-furnaces.

FRANCE.

Current List of Patents.

61,492. Landois, Extracting brilliant gold from its ores.
61,510. Bernard, Safety miners' lamps that cannot be opened without being put out.
61,512. Boitelle, A process for charring wood for mines.
61,561. R. de Massy, A process for obtaining baryta and strontian.
61,586. Laurent, A furnace for annealing malleable cast-iron.
61,598. Chapellier and Charles, A system of twyers for forges.
61,622. Schaller, Obtaining ferrocyanide of ammonia.
61,652. Serigiers and Troquier, A hydro-carburetting vaporiser.
61,656. Basset, Manufacture of aluminium.
61,658. Bouton, A process of manufacturing coke.
61,705. Mond, Manufacture of sulphur and sulphurous acid extracted from the residues of washed soda and similar substances.
61,755. Durand, Hennecart, and Durand, Boring holes in stones by means of the blowpipe.
61,768. Peugeot, Bros., A continuous annealing furnace.
61,771. Sagey and Rives, A mechanical process for preparing ores and sand containing metals.
61,822. Marques-Millan, Extracting silver from lead.
61,825. Mushet, Manufacture of cast-steel.
61,827. Penrice, Machines for boring tunnels and galleries in rock.
61,829. Salomon, Simultaneously obtaining ammonia and steel by treating pig-iron by means of azote vapours.
61,830. Scheibi, Extracting potash.
61,846. Chambeyron, Cementing and oxidising iron and steel.
61,900. André, Utilising the residue of tinned iron.
61,909. Guicherd, Process for smelting malleable cast-iron by means of which the residue may be resmelted and improved.
61,927. Smith and Savage, Manufacture of sulphuric acid.
61,937. Champin, Cokekilns and furnaces.
61,971. Cotelle, An apparatus for concentrating sulphuric and other acids.

62,051. Malo, Distilling and purifying oils obtained from bituminous schist.
62,059. Sudre, Reheating and welding iron and steel.
62,072. The Chatillon and Commentry Iron Co., Manufacturing armour-plates.
62,207. Lagache, Process for obtaining soda.
62,275. Onions, Manufacture of iron and steel.
62,301. Harrisson, Machines for cutting coal and ores.
62,314. Smith, Cupolas for smelting metals.
62,386. Bronde, Provence charcoal.
62,414. Armelin, Conglomerated fuel called "French coal."
62,422. Carvès and Co., Regulating the motion of coal-buddles.
62,490. Dinant, Fastening miners' safety lamps.
62,508. Tooth, Manufacture of iron and steel
62,550. Garnier, Furnaces for reducing zinc-ores.
62,561. Praire, Conglomerating small coal and pulverised anthracite.
62,655. Martin, Improving the quality of iron in refining.
62,659. Salles, Conglomerating small pyrites of iron.
62,692. Aubertin, Converting fossil phosphate into lime or alkaline phosphates.

PRUSSIA.

Patent cancelled in August.

2. J. H. F. Prillwitz, A machine for washing or buddling ore.

UNITED STATES.

Patents Issued from July 12th to Sept. 6th.

43,468. J. M. Allenwood, Improved hydraulic machine for washing ore.
43,475. W. Budd and J. L. Husband, Improved artificial fuel.
43,493. W. W. Grier and R. H. Boyd, Machine for mining coal.
43,507. J. B Johnson, Improvement in amalgamating barrels.
43,523. J. Phillips and A. Tschop, Improvement in rock drills.
43,557. F. Weil, Coating and bronzing metals.
43,562. J. N. Bird, Manufacture of steel.
43,574. J. C. Dickey, Apparatus for washing and amalgamating gold.
43,587. J. Jenkins and J. McMahon, Manufacture of oxide of zinc.
43,589. J. Kenyon, Improvement in amalgamators.
43,595. A. Manvel, Manufacture of malleable iron
43,630. C. De Bussy, Improvement in preserving iron from corrosion.
43,646. S. H. Rounds and W. L. Strong, Machines for concentrating the dust from ores, mills, &c.
43,695. H. S. Lucas, Improved artificial fuel.
43,732. C. V. Wilson, Composition for carbonising iron.
43,760. J. H. Connelly, Composition for desulphurising coal.
43,764. W. M. Everitt, Twyers for blast-furnaces.
43,813. T. Chappell and W. A. Jones, Hardening iron.
43,871. A. B. Sprout, Tempering steel.
43,880. M. J. Davies, Puddling furnaces.
43,891. W. M. Arnold, Improved composition iron.
43,892. W. W. Ball, Improved twyer.
43,983. W. R. Frink, Amalgamating ores of silver.
44,013. T. A. Morris, Quartz crushers.
44,043. A. W. Hall, Syphon for separating gold from crushed quartz.
44,062. E. H. Ashcroft and A. Betteley, Preparing peat fuel.
44,086. M. G. Farmer, Improved alloys of aluminium.
44,108. A. B. Nimbs, Coal elevator buckets.
44,112. A. Pierce, jun., Treating impure zinc.
44,122. J. W. Stanton, Quartz crushers.
44,137. W. Archer, Distilling hydro-carbon oils.
44,140. A. W. Hall, Improved amalgamator.
44,145. G. W. White, Apparatus for roasting and reducing ores.

SPECIFICATIONS PUBLISHED, AND PRICES.

FROM AUG. 27TH. TO SEPT. 17TH.

*** Specifications will be forwarded by post on receipt of price and postage at Her Majesty's Patent Office, 25, Southampton Buildings, London, W.C.—The amount of postage may be estimated from the price, as follows:—Where the price does not exceed 1*s.* 6*d.*, postage will be 1*d.*; above 1*s.* 6*d.*, and not exceeding 3*s.* 4*d.*, it will be 2*d.*; above 3*s.* 4*d.*, and not exceeding 6*s.* 4*d.*, it will be 4*d.*—Sums exceeding 5*s.* must be remitted by P. O. O., on Holborn Office, payable to *Bennet Woodcroft*.

58 (1864). B. SAMUELSON, Smelting iron ores; 4*d.*
90 (1864). C. BARTHOLOMEW, Working coal; 1*s.* 8*d.*
100 (1864). W. DENTON and J. WHITAKER, Winding apparatus for collieries; 6*d.*
109 (1864). J. E. BAKER, Retorts and furnaces for distilling coal; 8*d.*
160 (1864). N. J. LEBRUN, Safety apparatus for mine cages; 4*d.*

Current Review of Mining, Quarrying, and Metallurgy.

CORNWALL, DEVON, AND WEST SOMERSET.

THE prospects of mining in Cornwall show no improvement; indeed, on the contrary, a gloomy feeling seems to prevail throughout the county. From our tabular abstract of mining accounts it will be seen that the amount of calls in the Cornish and Devon mines during the past month was 34,681*l.* against 16,799*l.* distributed in dividends; showing a balance of loss of 17,882*l.* The real loss is of course greater than shown, for while no dividend is omitted several calling mines are necessarily left out. As showing the extent to which this state of affairs has now got we may mention that of the 160 mines now working to the west of Camborne only two are paying regular dividends.

The copper standard steadily crept up through the first three weeks of the month, but relapsed again at the last sale, leaving, however, an advance on the whole of about 1*l.*; but the tin standard has been put down 2*l.* per ton. Pressure on our space compels us to postpone some further remarks we intended to make on the sale of tin ore; but we may refer to the discussion at the last South Frances meeting on this subject, when it was the unanimous opinion of those present that the system now pursued is most unsatisfactory both for the smelter and miner. It was also suggested that at all meetings of mining adventurers the question of selling at a ticketing should be discussed.

The *West Briton* on the subject of mine accounts remarks—"We continue to receive numerous communications as to the mode of publishing mine accounts. In many cases, certainly, they are most unsatisfactory. A large number of those issued contain a mere outline of just what it suits the convenience of a purser to give, and in most instances they are deficient in what the proprietors of any well-regulated business would consider really essential. A mere statement of receipts and expenditure may be all very well, if *all the items* are duly charged up; but that is rarely the case. The liabilities and assets ought almost invariably to be given, and more details as to the expenditure and receipts." There can be no doubt that the power assumed by the Cornish pursers, and their mode of conducting the business of their mines, so as, as a rule, simply to subserve their

private interests, is, in the great majority of cases, a crying evil, and we shall have something to say upon the matter shortly. Of course there are some remarkable exceptions, but the *system* is wholly bad and indefensible.

There is little new to notice in the prospects of mines:—At *Great Wheal Vor* the lode in the bottom of Ivey's shaft is worth over 200*l.* per fm., and the 162 and 184 levels, driving west of Metal to meet the shaft, are equally rich; ten ends in course of driving, are worth on an average over 77*l.* per fm. *Prosper United* is reported to be looking very well. At the last setting 2 pitches in the 80 were let at 1*s.* 1*d.* and 2*s.* 8*d.* in the £ respectively; and the average tributes were lower than formerly. At *East Lovell* the only point to notice is the sinking of the new shaft to ventilate the bottom of the mine, which will take about two months more, until which nothing of interest can be expected. At *New Rosewarne* a branch of grey ore has been met with in the flat-rod shaft, reported worth 60*l.* per fm., but is now only worth 20*l.*, and declining. At *Trelyon Consols* the branch in the bottom of the 20 fm. level is reported worth 40*l.* per fm., and supposed to be opening a *carbona*.

At *Dolcoath* the lode in the bottom level, east of the engine shaft, is much improved, being worth 90*l.* per fm.; the bottom levels west are still poor. At *Stray Park* the lode in the shaft is worth 22*l.* per fm., and the 192 is being driven east for the purpose of communicating with Dolcoath. At *East Pool* the 160 east is worth 30*l.* per fm.; the 160 west 30*l.* It is said that there is 20,000*l.* worth of tin and copper discovered in the back of the 150 alone. Should the 160 turn out according to expectation, this will be a really valuable mine. At *South Tolgus* the 140 west, coming on the shoot of ore gone down above is said to be still improving.

At *North Roskear* the western levels on the copper lode continue to open through a large lode, producing copper, but not sufficient to pay for stoping. At *Wheal Seton* Tilly's shaft still yields 20 tons of good ore per fm.; the 160 west of sump winze 10 tons; and the 160 east 15 tons. The mine is said to be looking very well. *West Seton* has generally improved, and is reported to be looking better than for the last 5 years. The *West Briton* remarks that at *Emily Henrietta* strong hopes are still maintained of making a good mine.

South Frances continues poor. At *East Grenville* a little ore has been seen in the 75 west, but several fathoms have still to be driven to get under the ore in the level above. At *Wheal Grenville* the winze has been holed from the 80 to the 90, east of new shaft, and will, it is said, open out good ground for stoping, At *East Carn Brea* No 3 lode has been cut into at Thomas's engine shaft at the 60 fm. level, and found to be worth from 2 to 3 tons of good ore per fm. The lode is not yet cut in the 70 cross-cut, but is almost daily expected.

At *Clifford Amalgamated* an important discovery is reported of a new lode which has been cut north of Buzza's shaft, said to be worth 120*l.* per fm., which is supposed to be in whole ground throughout the mine. The discovery of the great abundance of lithium in the thermal water issuing from the hot lode in this mine, as will be seen from Prof. Mlller's paper, may be found of economic importance. This metal is said to be of importance in medicine, where it would be much more used if it could be got. Its present price is stated to be 25*s.* per oz.—5 tmes the value of silver. At *West Damsel* the new shaft below the 130 is reported to be looking promising. At *St. Day United* the lode in Opie's shaft is worth 45*l.* per fm.; the 180 east 12*l.* per fm.; the 174 west 18*l.* per fm.

At *North Treskerby* a good lode still continues in the 100 east. At *Great Wheal Busy* the 90 east of Matthew's shaft has improved to 60*l.* per fm. for tin. *Great North Downs* is reported to be looking promising. *Wheal Rose* still continues to look well, and took the chair at the last ticketing at Truro, on the 29th, for 515 tons, taking precedence of South Caradon for 511 tons. It is stated that twice as much ore is being discovered as is being taken away. At *Cargoll* the lode in Michell's engine shaft continues to look very well, a branch of the west lode has been intersected which is of a very kindly character.

Among the mines in the eastern part of the county, *West Caradon* is poor, and it is recommended to stop that part of the mine on Pryor's lode, and to sink Hallett's shaft, and also to drive the 92 cross-cut to intersect Clymo's lode and Jope's lode. It is also recommended to sink the engine-shaft to the 175. To follow out these recommendations will entail a loss of about 350*l.* per month. *Polmear* is reported to be improved. At *Kelly Bray*, in sinking a winze below the 25 fm. level, a course of ore has been cut said to be worth 50*l.* per fm.

Among transactions at mine meetings:—At *Condurrow* a step has at last been made in the right direction by meeting the debt which has been accumulating for the last couple of years. At *Leeds and St. Aubyn* meeting (on August 30th) it was resolved that the purser, Mr. William Vawdrey, be empowered to negociate with Mr. Martyn for the sale of the mine and materials. At *Wheal Margery* meeting (on September 12th) it was announced that the lords have given up 12 months' dues, with the understanding that the full amount is to be paid for the current year, At *Grambler and St. Aubyn* meeting (on September 13th) it was resolved to work the eastern ground separately under the name of East Wheal Grambler.

The only new undertaking announced during the month is the *North Tamar Lead and Silver* Mining Company, Limited, with a proposed capital of 15,000*l.*, in 5,000 shares of 3*l.* each. The object is to purchase the North Tamar Mine, in Devonshire. The purchase money is 5,000*l.*, one-half in paid-up shares.

WALES AND THE BORDERS.

South Wales.—The heavy fall of rain during the past month has given renewed activity to the iron trade, all the works being in regular employ, and makers well supplied with orders. There was a slight improvement in the tin-plate trade at the beginning of September, which has, however, been scarcely maintained.

It is stated that the *Varteg* furnaces have been relinquished by Messrs. Partridge and Jones, and the works have been taken by Messrs. G. E. Bevan and Co., proprietors of the adjoining Golynos Works. There are two furnaces at Varteg, one of which is now in blast. Messrs. Bevan and Co. having been successful in producing good iron from their Northamptonshire ore at Golynos, it is believed that they will use the ore at Varteg as well.

The coal trade in this district has been very brisk, and coke has also been in moderate demand. It is stated that Mr. Glasbrook, of Morriston, is opening a colliery at *Penclawdd*, the working of which will, it is said, extend over 1,600 acres.

From the returns of the coal and iron exports, it appears that during the month of August, the total quantity of coal exported from

the port of *Cardiff* was 138,737 tons; iron, 12,663 tons; preserved coal, 2,374 tons; and coke, 778 tons. The total exports for the eight months of this year are 964,799 tons of coal, and 116,877 of iron.

During the month of August, there were exported from *Newport*, 28,463 tons of coal in 66 ships, against 17,675 tons in July, and 12,394 tons in the corresponding month in 1863, being an *increase* almost unprecedented in the annals of the port. Coastwise the shipments were 56,133 tons of coal, against 52,422 tons in the previous month, and 50,655 tons in the corresponding month of last year. The exports from *Swansea* reached 51,041 tons, against 35,133 tons in July, and 34,007 tons in August, 1863. There were shipped coastwise 27,948 tons of coal, and 3,768 tons of patent fuel, as compared with 23,491 tons of coal in the previous month, and 18,889 tons in the corresponding month of last year. *Llanelly* exported 13,729 tons of coal, against 10,675 tons in the previous month; and the shipments coastwise were 24,459 tons, as compared with 26,679 tons in July, and 26,888 tons in August of last year.

The imports into Swansea include:—Copper ore from Seville, Aveiro, Coquimbo, Santander, Cuba, Caldera, and Krageroe; lead ore from Cagliari; copper regulus from Caldera, Huasco, and copper unwrought in pigs from Guayacan and Caldera; iron ore from Cherbourg; zinc ore from Adra and Tindered; silver ore from St. Brient and Caldera; and nickel ore from Krageroe.

GLOUCESTERSHIRE AND SOMERSETSHIRE.—The imports into Bristol include:—404 tons of sulphur ore, and 252 tons of pyrites from Arklow; 87 barrels of sulphur from Liverpool; 140 tons of lead from Aberystwith; 100 tons of silver-lead ore from Teignmouth; 100 tons of sulphur ore from Pomaron; and 1,561 bars of iron from Gothenburg. During the month of August, 1,948 tons of coal and 911 tons of iron were exported oversea from Bristol, as against 200 tons of coal and 1,131 tons of iron in the month of July, showing an *increase* of 1,748 tons in the exports of coal, but a *decrease* of 220 tons in the shipments of iron.

NORTH WALES.—The *Times* in referring to the progress of gold mining in Wales states that several of the gold companies have recently held their ordinary general meetings, and the information rendered to the shareholders shows that in the majority of instances the prospect of anything like a reasonable return is a very remote one. It is true there are traces of gold in small quantities, but not sufficient to pay for the expense in separating it from the other strata, and experienced gold diggers have, from the commencement, expressed their doubts as to whether the precious metal will ever be found in the Welsh mines in sufficient quantities to pay.

MIDLAND COUNTIES, SOUTH LANCASHIRE, AND SOUTH YORKSHIRE.

STAFFORDSHIRE AND WARWICKSHIRE.—The state of affairs in this district with regard to the colliers' strike, which has now been going on for three months, remains substantially unaltered, and if it continues much longer almost all the collieries will be standing at a time when fuel will be still more needed. Some of the ironmasters are importing largely from other districts, but some substantial masters have

expressed their determination to blow out their furnaces and close portions of their finished ironworks rather than continue to carry them on with facilities other than those afforded by the district itself. On September 21st a meeting was held at the Town-hall, Birmingham, when it was unanimously resolved that the colliers and their employers be earnestly requested to accept the arbitration of Lord Lichfield, and Lord Lyttelton, the lords-lieutenant of the counties of Stafford and Worcester, together with the Mayor of Birmingham.

DERBYSHIRE.—On September 1st a rise took place in the price of coal, of about 9*d.* per ton, and, the demand having greatly increased, a further rise is shortly expected. Several new works of large extent are being rapidly pushed forward, so that in the course of next spring the get of coal in North Derbyshire will be materially increased. The iron trade is also very active. It is said that a large iron-smelting works in the neighbourhood of *Dronfield* is about to be transferred to a limited company.

SOUTH YORKSHIRE.—Both the coal and iron trades maintain their activity notwithstanding the various strikes and lock-outs. At *the Bowling, Low Moor* and other ironworks, the men have resumed work, and most of the furnaces are now in full operation. At the *Oaks* and *High Royd* collieries, however, the men are still out, and although there have been several rumours of an amicable arrangement between the masters and colliers, nothing satisfactory seems to have been arrived at.

SOUTH LANCASHIRE.—The coal trade has been more animated during the last few weeks, particularly in house-coal, dealers having given in much larger orders than usual. The men have also been settling down quietly to work.

At the beginning of September the iron trade was very brisk, but towards the end of the month business became very slack, and there was a great falling off compared with the corresponding period of last year.

NORTHERN COUNTIES, NORTH LANCASHIRE, AND NORTH YORKSHIRE.

NORTHUMBERLAND AND DURHAM.—The iron trade remains without material alteration. The disputes between the iron masters and the men still continue, but the prompt measures adopted by Messrs. Palmer Brothers, of Jarrow, in taking legal proceedings against the secretary of the Labourers' Aid Society for intimidation, upon which charge he was sent for three months to gaol, and the further committal of seven other men to gaol for one month each, who had left their blast-furnaces at that place without leave, have had a tendency to check the turn-out of labourers and other workmen on the Tyne.

On September 21st, all the men employed at the iron works of Messrs. Bolckow and Vaughan, *Middlesbro'*, turned out in a body on account of the conduct of a watchman at the works, who, it is stated, prevented his companions from carrying an injured man to the infirmary, in consequence of which he died without medical assistance having been called. This has been settled by the resignation of the watchman, and the men have returned to work.

The blast-furnaces in course of erection by Sir William Armstrong

and his partners at *Elswick*, are rapidly approaching completion, and will soon be in active operation. An ample supply of ore will be obtained from the Ridsdale mines, on the North Tyne, the iron produced from which has been proved to be of superior quality. A site is being sought west of Elswick, on which a local firm purpose to erect extensive rolling and puddling mills.

It is stated that another limited liability company for iron-making has been started at *Stockton*, with a capital of 100,000*l*.

The coal trade of this district has been brisk, although the threatened strikes have had a marked effect. In some cases, the disputes have been satisfactorily settled, while others still remain undecided.

The *Stella* Coal Company are progressing rapidly with the sinking of their new pit near Blaydon-on-Tyne. It is expected to open out some excellent seams of gas coal, and a long range of coke ovens are in course of erection near the spot. The *Mickley* Coal Company are sinking a new shaft near Prudhoe. The *North Seaton* Steam Coal Company have suspended the sinking of a large pit at Cambois, on the river Wansbeck, until the erection of powerful pumping and winding machinery is completed. They have at present Cowpen, Sleekburn, North Seaton, and Newsham collieries in full work.

On Sept. 7th, an explosion occurred at *Seghill* Colliery, causing the deaths of seven of the workmen, and injuring nine others.

The exports from the Tyne include:—49,309 tons of coal; 3,600 tons of coke; and 16,750 cwts. of iron.

SCOTLAND.

The coal trade still maintains the same position as during the last few months, and the general briskness having extended itself to *Mid* and *East Lothian*, in some instances an advance of wages has taken place. An advance of 6*d*. per day is also now being paid to the colliers in the *Wishaw* district, and when the advance becomes general prices are expected to rise. Stocks at the pits in this district are generally light.

With regard to the iron trade, there is little of fresh importance to notice. The prices of bars have been firmly maintained, and there has been no scarcity of orders.

The shipments of Scotch pig-iron during the first eight months of the current year, compared with those of the corresponding periods of 1863 and 1862, have been as follows:

Month	1864. Tons.		1863. Tons.		1862. Tons.
January	38,476	...	30,467	...	44,729
February	45,843	...	38,807	...	39,614
March	61,525	...	50,909	...	44,495
April	76,176	...	70,995	...	66,975
May	64,698	...	54,170	...	56,646
June	53,019	...	52,167	...	52,167
July	63,619	...	62,639	...	51,716
Aug. 6	8,681	...	14,641	...	11,447
,, 13	11,327	...	10,895	...	12,847
,, 20	8,998	...	8,869	...	11,341
,, 27	12,614	...	13,671	...	12,255
Total	444,976		408,230		404,232

It is reported that a good discovery of blackband ironstone has been made at *Rankinston*, in the parish of Coylton, Ayrshire.

CONTINENT OF EUROPE AND MEDITERRANEAN COUNTRIES.

FRANCE.—The iron trade continues dull, and the demand for iron very inactive. The great meeting of the *Besançon* iron-masters has just been held, when a reduction of 16*s.* per ton was decided upon, making the present price 6*l.* 16*s.* It was stated that the fine pigs of France Comté did not run off easily, in consequence of the competition of inferior pig from other sources.

It is stated that the Marquis de Lambertie, the purchaser of the Granville forges, intends erecting three large blast-furnaces in the neighbourhood of *Longwy*. The furnaces of MM. Labbè and Legendre, and of M. d'Adelsward, in course of erection, are being actively pushed forward. M. Girard has put in activity the old furnace of Longwy Bas, while a second is in course of construction. At Noveant a second furnace is completed, and MM. Dupont and Dreyfus are also about to instal one or two furnaces. A third furnace in the Haute-Marne district is to be applied to the manufacture of coke-made pig.

The imports of coal into France during the first seven months of 1864 were 2,978,337 tons; of which 767,947 tons was imported from England, and 1,730,893 tons from Belgium.

BELGIUM.—Metallurgical industry in Belgium is reported to be in a favourable condition; prices are very firm, and quotations would no doubt advance but for the unfavourable state of the money market. At *Liége* refining pig is quoted from 2*s.* to 4*s.* above former rates, and great activity is reported in the works of that district. The *John Cockerill* and *Esperance* companies have each lighted a blast-furnace.

The report of the *Providence* Forges Company of the exercise terminating June 30th, 1864, states that the works continue to make regular and satisfactory progress. The production for the year amounted to 51,123 tons of pig, and 23,848 tons of rolled iron. The net profit was 32,729*l.*, out of which a dividend of 4*l.* per share was declared.

The coal trade remains quiet. The quantity of coal exported from Belgium during July was 346,769 tons, of which 326,975 went to France. From January 1st. to July 31st. the exports of coal were 2,034,799 tons, a little more than during the corresponding period of last year.

HAMBURG.—A deposit of pottery clay has been discovered near this city, and a limited company is about to be formed for the purpose of working it.

NORTH AMERICA.

LAKE SUPERIOR REGION.—Mining operations in this district are being actively carried on, and the following mines have paid semi-annual dividends: the *Quincy* of $8 per share; the *Pewabic* of $7; and

Franklin $5. At the *Pewabic* mine the man-engine is now in daily operation.

The iron trade of *Marquette* is reported to be in a very flourishing condition, the exports for the present season, up to August 11th amounting to 119,542 tons of iron-ore, and 6,357 tons of pig-iron; of a total value of $949,244 (189,848*l.*).

It is reported that a rich mine of plumbago has been discovered on the tract of the *Marquette Silver* mining company.

UNITED (ATLANTIC) STATES.—It is stated that the excitement in oil wells in *Pleasant County* runs very high. On Horse Neck, French, and Cow Creeks there are nearly a thousand wells in progress. One cannot ride any considerable distance, even in the most obscure places, without coming upon an engine puffing away and driving a shaft into the bowels of the earth. On the Ohio side of the river the same excitement prevails, and a large number of wells are being bored. Upon an average there are about ten men at each well, which fact will give the readers an idea of the immense amount of money and labour that is being employed in the search for oil. A majority of the operators are from the Eastern cities.

CALIFORNIA AND BORDER TERRITORIES.—Coal is reported to have been discovered near Salt Lake city. It is said that large discoveries of silver have been made in the Bannock county which have given rise to a general prospecting for that metal.

River mining throughout the state has commenced with great briskness, giving promise of an unusual gold harvest until the middle of December.

The amount of bullion received at the different assay offices in Austin during the month of July was 74,450 oz., and during that month the mills were only at half work.

It is stated that an extensive seam of excellent coal has been struck on the property of the Newcastle coal company in El Dorado Cañon.

It is reported that new and rich discoveries have been made on the Middle Fork of the John Day, about thirty miles beyond *Cañon City*. Parties have been working out there for several months past, making fair wages, but recently they have struck it very rich.

It is stated that silver mines of great promise have been discovered on the head of the west fork of Walker's river, directly south of *Silver King* district, some twenty or thirty miles from Silver Mountain.

It is reported that a nugget of pure gold, weighing 16½ lbs., has been found on the north fork of the American river, near Michigan Bluffs, *Placer* County. The run for the week on this claim was $5,400, only eight men being at work.

It is said that, notwithstanding the prevailing depression in mining interests generally, an increased activity seems to be manifested in the mines about *Monte Diablo*. The miners there continue to push on their work with unabated zeal, and increased confidence in the ultimate success of their labours in developing valuable and permanent veins of mineral.

VANCOUVER ISLAND.—The exploration expedition fitted out partly by the Government and partly by private enterprise, discovered, in the latter part of July, gold diggings on the Sooke river, only 21 miles

from Victoria. It is stated that on one branch of the stream as much as $4 to the pan has been obtained, and on the main stream from 1c. to 20c., averaging four times the quantity really required to pay.

BRITISH COLUMBIA.—It is reported that several acres of ground have been discovered near Lilliooet, in British Columbia, covered with black bituminous substance supposed by the finders to be petroleum, or coal oil croppings, as they call it. By others it is thought to be the ordinary asphaltum. A quantity has been sent to the Government house for analysis.

AUSTRALASIA.

VICTORIA.—At *Port Phillip and Colonial* the quantity of quartz crushed during the month of June was 4,104 tons. The yield of gold being 1,105 oz. 16 dwts., or a general average of 5 dwts. 9 grs. per ton. The receipts during the same period were 1,578*l.*, and the payments 1,230*l.*, leaving a profit of 348*l.* The average yield has been low, especially the quartz from the Old Man vein, which has given less than 4 dwts. per ton. The quantity of quartz crushed during 4 weeks of July was 4,319 tons; yield of gold, 1,260 oz., or about 6 dwts. per ton.

SOUTH AUSTRALIA.—From the various Australian Companies the directors have advices up to July 27th. From *English and Australian* advices state that there were 4 furnaces at work at Kooringa, and 5 furnaces and 1 refinery at the Port Works. A shipment of 120 tons of copper has been made to India.

At *Kapunda* the quantity of ores raised in May was 285 tons, of 16½ per cent. average produce, equal to 46¾ tons of pure copper, exclusive of 40 tons of sulphur ores for flux. The quantity raised in June was estimated at about 330 tons' wet weight.

From *Yudanamutana* Captain Anthony reports that at Blinman mine there is a good lode in No. 4 shaft, in continuance of the Big Bunch.

At *Worthing* 260 tons of ore were raised and dressed, and 50 tons of regulus made during the month.

NEW ZEALAND.—The New Zealand papers give accounts of an exploring expedition, consisting of three miners, from Queenstown, Otago, to the West Coast, in search of a goldfield. The party were supposed to have perished, but were rescued by a yacht on the Dart river. They state that they have explored the whole of the tract of country marked on the maps 'unknown,' a portion of which is in the province of Otago and a portion in that of Canterbury. They reached Jackson's Bay and then set back homeward. They found gold in payable quantities in several places, the furthest about 80 miles inland from Jackson's Bay; and at this spot they are confident a payable goldfield exists. They declare that the belt of country through which they passed is auriferous nearly throughout. They found innumerable quartz reefs, and gold in several of them. In some of the creeks the gold could be plainly seen, and every trial proved the existence of gold in them. They also found various other minerals, and copper in several places.

Record of the Mining and Metal Markets.

METALLIC-ORE MARKETS.

TIN ORE.—The standards for tin ore were reduced £2 on the 15th, and now stand at:—

Superior Fine	... £99	Superior Common ...	£95
Second Fine	... £97	Second Common ...	£94

COPPER ORE.—At the five copper ore sales included in our present number—four Cornish sales (on the 1st, 8th, 22nd, and 29th) and one Swansea sale (on the 13th)—the number of tons of ore, number of tons of fine copper, average produce per cent., average cost per ton of ore, average cost per ton of copper in ore, average returning charges for the total number of tons of ore required to produce a ton of fine copper, and the average total cost of a ton of fine copper to the smelter, at each sale, and for the whole month (including the total amount of money realised), have been as follows, which show as compared with last month *a falling off* in the quantity of fine copper of 75 tons 5 cwts. 3 qrs. and in the amount of money of £4,328 3*s*. 6*d*., with an *advance* in the produce of $\frac{1}{4}$%, and in the cost of copper of £1 5*s*. 6*d*.

Date.	Tons of Ore.	Tons of Fine Copper.	Average Produce.	Average Cost per Ton of Ore.	Average Cost per Ton of Copper in Ore.	Average returning Charges.	Average Cost of Fine Copper.
Sept. 1	2,837	189 3 0	6½	£5 8 5½	£81 6 10	£17 9 11¼	£98 16 9¾
„ 8	2,083	134 1 0	6 5/16	5 5 0	81 11 11	17 15 4¼	99 7 3¼
„ 13 *	851	82 16 3½	9¾	8 2 10	83 12 10	15 2 8¾	98 15 6¼
„ 13 †	1,216	277 2 2	22¾	19 10 9	85 14 7	12 3 11¼	97 18 5¼
„ 22	4,506	254 6 0	5¾	4 12 7½	82 1 6½	18 17 2¼	100 18 8¼
„ 29	3,683	227 13 0	6 3/16	4 18 3	79 9 5	18 1 9¼	97 11 2¾
	15,176	1,165 2 1¼	7 1/16	6 6 5¾	82 7 5¼‡	16 10 3	98 17 8¼
	Totals for the Month:			Averages for the Month:			
	Amount of Money: £95,974 7 0						

* British and Irish Ores. † Colonial and Foreign Ores.
‡ Equal to 16*s*. 5¾*d*. per Unit of Copper.

LEAD ORE.—The prices of lead ores sold during September, compared with those sold during the previous month, show a decline in almost every case.

COAL MARKETS.

LONDON.—Mr. J. R. Scott, Registrar of the London Coal Exchange, has favoured us with the following statistics of this market for the month of September, of which detailed particulars will be found in Mr. Scott's monthly published returns. The total quantity of seaborne coal, culm, and cinders imported into London during September, was 222,500 tons, against 274,187 tons during the corresponding month of last year,—showing a *decrease* of 51,687 tons. The following are the particulars of the 222,500 tons imported during September:—

Newcastle ...	90,681	tons in	210 ships	Scotland ...	769	tons in	5 ships
Seaham ...	9,663	,,	41 ,,	Wales ...	4,054	,,	11 ,,
Sunderland .	66,400	,,	161 ,,	Yorkshire ...	2,478	,,	21 ,,
Middlesbro' .	7,491	,,	26 ,,	Small ...	2,438	,,	7 ,,
Hartlepool ..	86,506	,,	133 ,,	Cinders ...	925	,,	7 ,,
Blyth ...	1,095	,,	4 ,,				

The quantity of coal imported by railways and canals during the month of September was 171,645 tons, against 168,385 tons in the corresponding month of last year, showing an *increase* of 3,260 tons. The following are the particulars of the 171,645 tons imported during September :—

	Tons.		Tons.
London and North Western ...	71,768	South Western...	1,625
Great Northern	64,195	London Chatham and Dover...	1,048
Great Western	4,000	Tilbury and Southend... ...	59
Great Eastern	18,625	Grand Junction Canal ...	731
Midland	10,594		

On September 2nd, the new ships arrived were 25; Haswell Wallsend, 19*s.*; Hartlepool Wallsend, 19*s.*; Heugh Hall Wallsend, 17*s.* 6*d.*; Hetton Lyon's Wallsend, 17*s.*; Hasting's Hartley, 18*s.* On the 5th, new ships, 50; a large demand for house-coal at an advance of from 6*d.* to 9*d.* per ton. On the 7th, new ships, 26. On the 9th, new ships, 53; market very active. On the 12th, new ships, 40; a continued demand for house-coal which was cleared out at a further advance of 6*d.* per ton. On the 14th, new ships, 45; house-coal still in considerable demand, and again risen 6*d.* per ton. On the 16th, new ships, 21; market steady. On the 19th, new ships, 21; market active. On the 21st, new ships, 32; Hartley's in less demand. On the 23rd, new ships, 55; business was done at a reduction of 3*d.* per ton; Hartley's continued dull. On the 26th, new ships, 68; little business; Hartley's reduced 1*s.* per ton. On the 28th, new ships, 57; an increase business done; house-coal reduced 6*d.* On the 30th, new ships, 39; an active demand for house-coal. Hetton Wallsend, 20*s.* 6*d.*; South Hetton Wallsend, 20*s.* 3*d.*; Lambton Wallsend, 20*s.*; Hartlepool Wallsend, 19*s.* 6*d.*; Tees Wallsend, 19*s.* 9*d.*; Stewart's Wallsend, 20*s.*; Hasting's Hartley, 19*s.*

LIVERPOOL.—From Messrs. J. and J. Platt's Coal Circular we find that the quantity of coal, cannel, coke, and patent fuel shipped from Liverpool to foreign and colonial ports during the month of September was 61,524 tons, against 59,184 tons during the corresponding month of last year—showing an *increase* of 2,340 tons. The exports coastwise during September were 11,563 tons, against 13,328 tons during the same month last year—showing a *decrease* of 1,765 tons. The total exports coastwise from January to September were 108,007 tons, against 74,667 tons during the corresponding period of 1863—showing an *increase* of 33,340 tons.

The quantity during the month of August was 71,637 tons, against 49,205 tons during the corresponding month of last year—showing an *increase* of 22,432 tons. The exports coastwise during August were 13,119 tons, against 9,915 tons during the same month last year—showing an *increase* of 3,204 tons. The total exports coastwise from January to August were 96,444 tons, against 61,339 tons during the corresponding period of 1863—showing an *increase* of 35,105 tons.

NEW YORK, *September 20th.*—The market for house-coal has been fairly active, but prices have tended strongly downwards. Foreign has been in moderate supply and firm.

BOSTON, *September 19th.*—English cannel has been quiet but steady at, from $33 to $34 per ton. Sydney have been selling at, from $13 to $14 per ton.

PHILADELPHIA, *September 19th.*—The market has been unsettled and dull, and in the absence of sales quotations are nominally unchanged.

CONTRACTS.—The Admiralty require twelve months' supply of South Wales coal, for the shipping calling at Corfu.

METAL MARKETS.

LONDON.—We have been furnished with the following report by *Messrs. Von Dadelszen and North.* The month of September has been one of great depression throughout the metal trade; but considering the state of the money market and the numerous announcements of mercantile embarrassments, it is satisfactory that prices have been well maintained.

IRON.—Welsh bars have been in request, and prices have advanced to 7*l.* 10*s.* f. o. b. Wales. Rails are also well maintained, the lowest price being 7*l.* per ton for ordinary sections. In Staffordshire iron, owing to the strike of the colliers, production has been much diminished, and consequently full prices are obtained for small quantities turned out. Scotch pig iron, after being pushed up to 59*s.* cash by Bears, has rapidly fallen to 56*s.* 6*d.* The Bulls have quite lost courage; and have realised considerable quantities.

COPPER.—There has been no official change during the month, but the demand has been slack, especially for raw, which has sold as low as 5*l.* under official rates. Manufactured has not been so depressed, but has sold as low as 101*l.* Foreign has been neglected, and prices purely nominal. Burra, 96*l.* Kapunda, 95*l.* Wallaroo, 94*l.*

TIN.—The upward tendency, which we reported last month made further progress during the first few days of September, and rather higher prices were paid for some small parcels in order to establish a price.

English tin was in fair demand during the first fortnight but the fall in Foreign caused the smelters to reduce the price on the 16th ultimo, 3*l.* per ton, both on common and refined, since which the demand has fallen off, and prices are somewhat irregular.

Straits, which early in the month stood at 103*l.* and 104*l.* 10*s.* prompt, advanced to 104*l.* cash and 106*l.* open; but a reaction set in and little business was done between the highest price and 100*l.* per ton, at which about 200 tons changed hands cash, one, two, and three months prompt. We quote present prices 98*l.* cash, and 100*l.* full prompt. In Banca, during September, prices ruled between 104*l.* and 105*l.*, the market followed the decline in Straits and English, and the lowest point touched was 98*l.*, since which the price has recovered to 99*l.*, our closing quotations. The Dutch market has been steadier, and the lowest point reached was 60½fl., but difficult to buy now at 61fl.

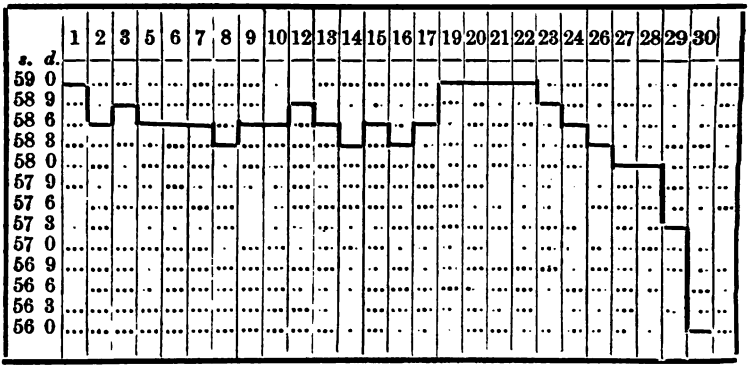
TIN PLATES.—The demand for this article has been extremely dull especially for charcoal; coke steady 23*s.* in London, 22*s.* 6*d.* Liverpool.

LEAD.—The market for this metal has been dull but prices steady.

SPELTER.—There has been a great falling off in the amount of business reported, and prices have gradually receded to 24*l.* spot. Hull

parcels have sustained their value better than London lots. The last sales having been at 24*l.* 7*s.* 6*d.*, W. H. 24*l.* 10*s.*

GLASGOW. IRON.—The Scotch pig-iron market has been on the whole quiet during the month of September. Prices fluctuated but little until the last week, during which there was a sudden decline of 1*s.* 9*d.* The market opened at the highest price of the month, 59*s.*, and fluctuated between 58*s.* 9*d.* and 58*s.* 3*d.* until the 19th, when it again advanced to 59*s.*, at which it continued firm until the 23rd, when it began to decline gradually until it reached 58*s.* on the 27th. On the 29th it suddenly dropped to 57*s.* 3*d.*, and on the 30th it fell as low as 55*s.* 9*d.* A large business was done on the 30th at 55*s.* 10½*d.* cash, market closing buyers 55*s.* 9*d.*, sellers 56*s.* No. 1, G.M.B., 56*s.* 3*d.*; No. 3, ditto, 55*s.* 3*d.* The following diagram shows, at a glance, the daily fluctuations of this market, the highest cash price of the day being given:—



COLOGNE, *September 27th.*—Notwithstanding the higher rate of discount the metal market has been in a satisfactory state, all articles maintaining their price except tin which has fallen.

IRON.—Charcoal-iron and Spiegeleisen have been quoted at (per ctr.) 1⅞-1¾ thlrs.; coke pig-iron, 1⅛-1¼ thlrs.; grey coke pig-iron, 1$\frac{4}{10}$-1½ thlrs.; Scotch pig, No. 1 1$\frac{6}{10}$-1$\frac{7}{10}$ thlrs.; bar-iron, large sizes, 3-3¼ thlrs.

STEEL.—Cast-steel has been quoted at 22-24 thlrs.; puddled-steel, 10 thlrs., and refined steel 14 thlrs.

COPPER.—Paschkoff, 40 thlrs.; American, 39 thlrs.; English, 34 thlrs.; first quality rosette copper 33 thlrs.; second quality, 31 thlrs.

TIN.—Banca was quoted at 37 thlrs.; and English in blocks at 36½ thlrs.

SPELTER.—This metal has been quoted at, raw spelter, 7⅞-8 thlrs.; rolled spelter, 9¼-9⅜ thlrs.

LEAD.—The prices of this article have remained without alteration. Refined lead 6¼-6⅜ thlrs. Unrefined lead 6¼-6½ thlrs.

ANTIMONY.—Regulus of antimony has been quoted at 16-16½ thlrs.

BERLIN, *September 26th.*—In consequence of the scarcity of money the prices have remained much the same in almost all articles, and but little business is looked for in the Autumn.

IRON.—Scotch pig (at per ctr.), No. 1 50-51 sgr.; Silesian charcoal pig iron, 51 sgr.; coke pig-iron, 48 sgr. delivered here; bar-iron rolled 3⅜-3⅝ thlrs.; hammered bar-iron, 4-4½ thlrs.

COPPER.—Large quantities of copper have arrived, but are being kept back for higher prices. The quotations are Paschkoff 41 thlrs.; Demidoff 35½ thlrs.; Swedish 33-34 thlrs.; best selected 32 thlrs.; tough cake, 31⅜ thlrs.

TIN.—In tin prices have fallen, and but little business has been done. Banca was quoted at 37 thlrs.; English 36 thlrs.

SPELTER.—A steady business has been done in this article. W. H. 7⅜; ordinary brands 7⅛ thlrs.

LEAD.—This article has been sought for, and shows steady prices, it is quoted, Tarnowitzer 6¾ thlrs.; Saxon 6⅝ thlrs.

BRESLAU, *September 27th.* SPELTER.—The market for this article has been dull, prices quoted ordinary brands 7 thlrs. 19 sgr.; W. H. 7¼ thlrs.

HAMBURG, *September 26th.*—The same dullness remarked in our last is still noticeable and the quotations are merely nominal.

IRON.—Scotch pig (per ctr.), 2⅝-2¾ mk.; English bar-iron, 6 mk; Staffordshire descriptions, 7 mk.; Swedish in bars 8½-8¾ mk.

STEEL.—Swedish in boxes of 1 ctr. 11½ mk.; Milan in boxes of 138 lbs. weight, No. 00, ½ sq. in. 18 mk,; No. 0 $\frac{1}{16}$ sq. in. 17 mk.

COPPER.—Business in this metal has come quite to a standstill; Drontheimer Röraas was quoted at 66½ mk.; Demidoff 72 mk.; Paschkoff 87 mk.; Lake Superior, 71 mk.; best selected 64 mk.; tough cake 62 mk.

YELLOW METAL has been quoted at 56 mk.

NICKEL in cubes (per lb.) 3-4 mk.

QUICKSILVER has been quoted at 28 sch.

SPELTER.—No sales have taken place lately in the article, and prices remain unaltered, Silesian spelter in slabs 16½-16⅝ mk. delivered here; common Silesian 19 mk.; Vieille Montagne 19½ mk.

TIN.—Banca was quoted 11½-¾ schl.; English 11¾ sch.; ditto in bars 12 sch.

LEAD.—Little has been going on in this article. German pig lead, 13½-13¾ mk.; English pig lead, 14¾ mk.; English rolled, 15¼ mk.

AMSTERDAM, *September 27th.*—TIN has been dull; Banca, 60¾-60½ fl.

ROTTERDAM, *September 27th.* COPPER.—Drontheimer, 62 fl.; North American, 60-65 fl. according to quality.

NEW YORK, *September 20th.* COPPER.—The market for American Ingot has been only moderately active, prices closing at 51 cents for Baltimore, and 52 cents for Lake.

YELLOW METAL has been firm, with an enquiry at from 72 to 80 cents.

BOSTON, *September 19th.* IRON.—Scotch pig has been dull, and prices tend downward. There is only to notice small sales at $78-$80 per ton, cash, for Gartsherrie. In American pig the sales have been at $72 50-$75 per ton, cash. The sales of bar iron have been confined to small lots.

HONGKONG, *August* 12th. IRON.—Nail rod, $3 50c.; hoop, $3 to $3, 50c.; bar, $2 80c. to $3 20c.

LEAD, common, $6 to $6 10c.; best, $6 20c. to $6 40c.; no sales.

SHANGHAI, *August* 3rd. IRON.—Nail rod 2-0-0 taels.

LEAD.—4-8-0 taels.

STOCK AND SHARE MARKETS.

LONDON.—The amount of business transacted during September has been unimportant. For the first week there was a firmer tone in the market, but this was speedily checked by the rise in the rate of discount, and since the 8th, the market has been exceedingly quiet and heavy, with an almost universal decline in prices.

The following have been the principal alterations in prices :—

Advanced.

Great Wheal Vor	2½	New Rosewarne	1½
Wheal Margaret	1	Pendeen	1¼
Wheal Mary Ann	1	St. John Del Rey	1¾
South Caradon	25	Peel River Land and Mineral .	3
Grambler and St. Aubyn ...	4	Alamillos	¼
Devon Great Consols	5		

Declined.

East Lovell	1¾	Wheal Grenville	½
Great Fortune	2	East Carn Brea	1
St. Ives' Consols	2	Great South Tolgers	¼
Trelyon Consols	4½	West Seton	10
West Chiverton	2½	North Roskear	2
Wheal Chiverton	2½	North Crofty	¾
Chiverton Valley	3	East Rosewarne	¼
Wheal Trelawny	1	Kitty (St. Agnes)	1¾
Wentworth Consols	1½	Ebbw Vale	¾
Mineral Bottom	1½	Fortuna	1
Gonamena	¼	United Mexican	¼
Tincroft	1	Panulcillo	¾
Cook's Kitchen	2½	Yudanamutana	¾
Stray Park	1½	Don Pedro North Del Rey ...	⅛
Camborne Vean	⅛	Port Philip	¼
Clifford Amalgamated	¼	English and Australian ...	¼
East Basset	2	Montes Aureos	⅛
Wheal Basset	2½	Nova Scotia Gold and Land ...	⅛

Among western tin mines the only noticeable advance has been in *Great Wheal Vor* shares which at one time had gone up from 27½*l*.-28½*l*. to 34½*l*.-35½*l*., but have since receded to 30*l*.-31*l*. *East Lovell* shares have been dull, and have declined from 8½*l*.-9½*l*. to 7*l*.-7½*l*. *Great Wheal Fortune* shares have again been flat and have gone back to 8*l*.-9*l*. There has been a further decline in *Providence* shares to 38*l*.-40*l*. *Wheal Margaret* shares have advanced to 8*l*.-9*l*. *St. Ives' Consols* shares, last quoted in May at 25*l*.-27½., have been quoted at 23*l*.-25*l*. *Rosewall Hill*, 2¾*l*.-3*l*. *Trelyon Consols* shares, last quoted in March at 11*l*.-12*l*., have gone back to 6½*l*.-7½*l*. *Grylls Wheal Florence*, 2½*l*.-3*l*.

In lead mines there has been a general decline in prices with the exception of *Wheal Mary Ann* shares which have advanced from 14*l*.-15*l*. to 15*l*.-16*l*. *West Chiverton* shares have been quoted down from 62½*l*.-67½*l*. to 60*l*.-65*l*. *Wheal Chiverton* shares have gone back from 8½*l*.-9½*l*. to 6½*l*.-6¾*l*. *Chiverton Valley* shares, which were last quoted in May at 4½*l*.-5*l*., have receded to 1½*l*.-2*l*. *Chiverton Moor*, 2½*l*.-3½*l*. *Wheal Trelawny*, 19*l*.-20*l*. *Wentworth Consols*, 8*l*.-10*l*. *Mineral Bottom* shares, last quoted in June at 6*l*.-6½*l*., are now quoted at 4½*l*.-4¾*l*.

There has been little doing in *East Caradon* shares, which have slightly declined. They opened at 27½*l*.-27¾*l*. and after receding to 26*l*.-27*l*. close 27*l*.-27½*l*. *South Caradon* shares have advanced to 520*l*.-530*l*. *Marke Valley*, 4½*l*.-4¾*l*. *Gonamena*, 3*l*.-3½*l*. *West Caradon*, 9*l*.-10*l*. *Glasgow Caradon*, 3*l*. 3½*l*.

There has been an universal decline in the Camborne and Illogan

tin mines. *Tincroft* shares have declined to 18*l*.-18½*l*. *Cook's Kitchen* shares have gone back to 13*l*.-14*l*. *Stray Park* shares have receded to 25*l*.-27*l*. *Condurrow* shares, quoted in our last at 50*l*.-60*l*. are now 80*l*.-90*l*.; but although this appears to be an advance of 30*l*., they really remain as they were, this advance being simply the amount of the last call. *Camborne Vean*, 1½*l*.-2*l*. *South Condurrow*, 28*s*.-30*s*. *Carn Camborne*, 34*s*.-36*s*.

Clifford Amalgamated shares, which opened at 30½*l*.-31½*l*., at one time were 1*l*. higher, but close slightly lower at 30*l*.-31*l*. *Great North Downs*, 4½*l*.-5*l*. *Hallenbeagle*, 3*l*.-3½*l*. *Great Wheal Busy*, 2¼*l*. *Grambler and St. Aubyn* shares, last quoted in June at 5*l*.-7*l*., are now reported at 9*l*.-10*l*. *Nanjiles*, 27*l*.-28*l*. *St. Day United*, 1½*l*.-1⅝*l*. *North Treskerby* 2⅞*l*.-3⅛*l*.

There has been some business in *East Grenville* shares but without any noticeable variation in prices. They close as they opened, at 7½*l*.-7¾*l*. *East Basset* shares opened on September 1st, at 64*l*.-66*l*., and gradually advanced up to the 24th to 68*l*.-70*l*.; but after that they quickly receded and close flat at 62*l*.-64*l*. *Wheal Basset* shares have declined to 90*l*.-92½*l*. *Wheal Grenville* shares have receded to 6½*l*.-7*l*. *North Basset*, 2¼*l*.-2¾*l*. *West Basset*, 8½*l*.-9*l*. *West Frances*, 32½*l*.-35*l*. *South Frances*, 40*l*.-50*l*. *Wheal Buller*, 18*l*.-20*l*. *South Grenville*, 11*s*.-13*s*.

There has been little business doing in the Redruth Mines. *East Carn Brea* shares have declined to 7*l*.-7¼*l*. *Great South Tolgus*, 2¼*l*.-2½*l*. *Wheal Union*, 1⅝*l*.-1½*l*. *Wheal Uny*, 4½*l*.-5*l*.

West Seton shares have gone back to 210*l*.-220*l*. *Wheal Seton*, 210*l*-215*l*. *North Roskear* shares have declined to 22*l*.-23*l*. *North Crofty* shares have receded to 3*l*.-3½*l*.

In eastern mines scarcely any business has been reported. *East Russell* shares have been dull at 5*l*.-5¼*l*. *New Martha* shares have been quoted daily but with very trifling variations in prices, their closing quotation being 1⅛*l*.-1⅜*l*. *Devon Great Consols*, 580*l*.-600*l*. *Hingston Down*, 4*l*.-4¼*l*. *Wheal Crebor*, 2*l*.-2½*l*. *Kelly Bray*, 7*s*.-9*s*. *Wheal Edward* shares, last quoted in May at 1⅛*l*.-1⅜*l*., have been quoted at ⅝*l*.-⅝*l*.

New Rosewarne shares which opened flat at 6*l*.-7*l*., being a reduction of 2½*l*. on our last quotation, have improved to 10*l*.-11*l*. *Pendeen* shares have also advanced to 3*l*.-3½*l*. *East Rosewarne* shares have gone back to 2¾*l*.-3⅛*l*. *Kitty* (St. Agnes) shares, last quoted in July at 6¼*l*.-6½*l*., are now quoted at 4½*l*.-4¾*l*. *Wheal Unity*, 4*s*.-5*s*.

Among Welsh and Isle of Man mines and undertakings, *Great Laxey*, 15*l*.-16*l*. *Prince of Wales*, 4*s*. 6*d*.-5*s*. 6*d*. *Vale of Towy*, 6*s*.-7*s*.

Among the new iron companies there has been very little doing, but prices are generally lower. *Ebbw Vale* shares have gone down to ½*l*. dis. *Millwall Ironworks*, 4¼*l*. *Humber Ironworks*, ¼*l*.-⅛*l*.

In foreign and colonial shares the amount of business has been almost nominal. *St. John del Rey* shares have advanced to 37¾*l*. *Peel River Land and Mineral* shares have also gone up to 4*l*. *Cape Copper*, 10⅜*l*. *Fortuna* shares have declined to 3*l*. *United Mexican* shares have also gone down to 5⅛*l*. *Panulcillo*, last quoted in June at 1⅝*l*., are now ⅞*l*. *Yudanamutana*, 2*l*. *Don Pedro North del Rey*, ¼*l*.-⅜*l*. *Port Phillip*, ¾*l*.-⅞*l*. *English and Australian*, 1⅜*l*. ex. div. *Kapunda*, 1¼*l*. *Cobre*, 30*l*. *Montes Aureos*, 1⅞*l*. *Alamillos*, 1*l*. *Anglo Mexican Mint*, 19*l*. *Linares* shares, last quoted in June at 6*l*., are now 5½*l*. *Quebrada Land and Mining*, 3⅞*l*. *Mariquita*, ½*l*. *Nova Scotia Gold and Land*, 1⅛*l*.-1¼*l*. *Anglo-Brazilian Gold*, 5*s*. *Vallanzasca*, 1⅜*l*.-1½*l*.

The only new undertaking quoted during the month has been *Chilian Mining and Trading*, ½*l*.-1*l*. pm.

CORNWALL.—The mining share market has again been dull. *East Grenville* shares have not been so much dealt in, and are reported weaker at 7¼*l.*-7⅜*l.* *Trelyon Consols* shares have been inquired for at 9*l.* *Wheal Grenville* shares in demand at 7¼*l.*-7½. *Tincroft* shares steady at 18*l.*-18¼*l.* *Basset and Grylls*, 6½*l.*-7*l.* *Cargoll*, 38*l.*-39*l.* *Carn Brea*, 55*l.*

BIRMINGHAM.—*Muntz Metal*, 2⅛*l.*-1⅞*l.* dis. *Nant Coal*, 8½*l.*

LIVERPOOL.—*Don Pedro North Del Rey*, ⅛*l.* dis. *Panulcillo* ¼*l.* pm. *Mersey Steel and Iron*, ⅛*l.* pm.

MANCHESTER.—*Stavely Coal and Iron*, 20 pm. ex. div. *Ebbw Vale*, ⅛*l.* dis.

DUBLIN.—In the Irish share market, the following have been the quotations;—*Mining Company of Ireland*, 27*l.* *Connorree*, 18*s.* *Wicklow Copper*, 14½*l.* *Carysfort*, 15*s.* *Killaloe Slate*, 19*s.*

NEW YORK, *September 20th.*—There has been a better feeling for mining stocks in this market, more especially the copper stocks of the Lake Superior region.

Coal Stocks.—These stocks have been steady, with a fair business doing. The following have been principally quoted. *American*, $83-$84; *Ashburton*, $16-$18; *Cumberland*, $60-$61; *Central*, $58-$59; *Consolidated*, $120-$123; *Delaware and Hudson*, $190-$191; *Pennsylvania*, $200-$201; *Wyoming Valley*, $50-$51.

Copper Stocks.—It is stated that large purchases have been made in these stocks at advancing prices. The following calls per share have been made—*Lafayette*, $1; *Ogima*, $1; *Humboldt*, $2; *Bay State*, $3; *Aztec*, $2; *Hancock*, $2; *Atlas*, $1: *Indiana*, $2; and *Winthrop*, $1. The following stocks have been quoted:—*Aztec*, $7-$7¾; *Bedford*, $1-$1¼; *Boston*, $4½-$5; *Canada*, $4-$4¼; *Carp Lake*, $5-$6; *Central*, $62½-$65; *Clifton*, $½-$2; *Derby*, $2; *Evergreen Bluff*, $19-$20; *Flint Steel*, $8-$10; *Frue*, $3½-$4; *Grand Portage*, $40; *Hamilton*, $2½-$3½; *Hilton*, $6; *Hudson*, $1-$2½; *Indiana*, $8-$9; *Isle Royal*, $15½-$16; *Keweenaw*, $6; *Knowlton*, $8-$10; *Lafayette*, $2-$2½; *Manhattan*, $7-$8; *Mendota*, $4½-$5½; *Merrimac*, $5-$5½; *Minesota*, $31-$32; *National*, $32-$33; *New Jersey Consolidated*, $2½-$4; *New York*, $2-$2½; *Norwich*, $2-$2½; *Ogima*, $5¾-$6; *Ontonagon*, $2½-$4; *Providence*, $1¼-$2; *Quincy*, $100-$102; *Reliance*, $2-$3; *Rockland*, $6-$9.

Gold Stocks.—These stocks have not been freely offered and business transactions have been on a small scale. The principal quotations have been:—*Benton*, $1½-$1¾; *Briggs*, $140-$150; *Corydon*, $3½-$4; *Gunnell*, $2½-$3; *Hope*, $8-$8½; *Isaac's Harbour*, $¾-$1; *Mariposa*, $43-$43¼; *Montana*, $1-$1¼; *New York* and *Nova Scotia* $⅝-$¾; *Rocky Mountain*, $9-$10.

Iron Stocks.—The following stocks have been quoted:—*Copake*, $6-$7; *French Creek*, $½-$¾; *Teal Lake*, $4½-$5½.

Lead Stocks.—Quotations have been as follows:—*Bucks County*, $⅛-$⅜; *Macomb*, $2½-$3; *New York and Boston*, $5-$7; *Sussex*, $¼-½; *Wallkill*, $2½-$3. [*** Quotations in Legal Tender Notes: American Gold, 223⅛ %]

SAN FRANCISCO, *August* 20th.—A better feeling has pervaded the mining market during the past month, and it is hoped that the turning point has been reached and that prices will now improve.

Gould and Curry shares have again declined, although a good many feet have changed hands. They were last quoted at $1,460. *Ophir* shares have been largely dealt in at fluctuating rates, quotations clos-

ing at $475. *Savage* shares have been in demand and have considerably advanced, closing at $1,275. *Potosi* shares have declined to $875. *Chollar* shares have considerably improved, and large sales have been made at prices ranging from $375 to $525, closing at $500. *Belcher* shares have been inactive at $850-$875. *Yellow Jacket*, $450. *Uncle Sam*, $250. *Imperial*, $130. *Lady Bryant*, $4¾. *Wide West*, $18. *Melones*, $17. *Sheba*, $20. *Baltic*, $13. *Golden Age and Empire*, $7. *Real del Monte*, $14½. *Hale and Norcross*, $300. *Burning Moscow*, $20. *** Quotations in Gold: Legal Tender Notes, 40 %.

ANALYSIS OF BOARD OF TRADE RETURNS.

THE "Accounts relating to Trade and Navigation of the United Kingdom, for the month ended 31st August, and eight months ended 31st August, 1864," give, on analysis, the following results as to the Imports and Exports of Mining, Mineral, and Metallurgical products, which show:—

On the EXPORTS for the month a *decrease* on the whole of nearly 60,000*l*. The decrease has been principally on the articles of railroad iron, iron hoops, iron wrought, copper unwrought, and pig lead. In railroad iron the most striking decrease has been on the exports to India (60,000*l*.). On iron hoops the only noticeable decrease is to Russia (30,000*l*.). In iron wrought, the decrease may be pretty nearly divided between Russia and India (each 15,000*l*.). In copper unwrought, the main decrease is on exports to France (70,000*l*.). In pig lead the decrease has been pretty generally distributed. There has been an *increase* for the month on the exports of coal and copper wrought. In coal this has been very generally distributed; but in copper wrought, the increase has been mainly to India (70,000*l*.).

IMPORTS.—The quantities and relative increase and decrease of the imports of metals, metallic ores, and mineral products, for the month and eight months ended 31st August, have been as follows:—

—	Month ended 31st July.			Seven Months ended 31st July.		
	1863.	1864.	Increase (+) or Decrease (−)	1863.	1864.	Increase (+) or Decrease (−)
Brimstone.....cwt.	109,051	71,570	− 37,481	493,085	519,151	+ 26,066
Copper Ore .....tons	7,072	10,570	+ 3,498	52,679	46,472	− 6,207
Copper Regulus ..... „	716	991	+ 275	12,467	17,060	+ 4,593
Copper, unwrought and part wrought .....cwt.	8,260	39,620	+ 31,360	157,080	276,900	+ 119,820
Iron, in Bars, unwrought, tons	7,155	9,747	+ 2,592	23,278	27,357	+ 4,079
Steel, unwrought ..... „	468	434	− 34	1,481	3,915	+ 1,481
Lead, Pig and Sheet ..... „	2,931	4,086	+ 1,155	17,156	20,607	+ 3,451
Spelter or Zinc ..... „	3,086	2,946	− 140	17,670	20,412	+ 2,742
Tin, in Blocks, Ingots, Bars, or Slabs.....cwt.	8,295	14,737	+ 6,442	30,319	42,832	+ 12,513
Silver Ore .....value in £	1,490	21,020	+ 19,530	178,471	162,948	+ 15,523
Petroleum.....tuns	2,338	2,416	+ 78	26,658	10,309	− 16,349
Pyrites .....tons	25,216	22,170	− 3,046	133,873	106,428	− 27,445
Quicksilver ..... lbs.	112,507	405,658	+ 293,151	563,112	2,952,272	+ 2,389,160

EXPORTS.—The quantities, declared value, and relative increase and decrease of the exports of metals, minerals, and metallurgical articles of British and Irish produce and manufactures, for the month and eight months ended 31st August, have been as follows:—

	QUANTITIES.				DECLARED VALUE.					
	Month ended 31st August.		Eight Months ended 31st August.		Month ended 31st August.			Eight Months ended 31st August.		
	1863.	1864.	1863.	1864.	1863.	1864.	Increase (+) or Decrease (−)	1863.	1864.	Increase (+) or Decrease (−)
					£	£	£	£	£	£
Alkali: Soda ..... cwt.	176,329	210,693	1,416,408	1,481,143	74,481	87,690	+ 13,209	589,169	618,208	+ 29,039
Coal, Cinders, and Culm ..... tons	773,167	905,977	5,445,134	5,804,033	336,666	425,289	+ 88,623	2,410,022	2,720,666	+ 310,644
Iron, Pig and Puddled ..... „	38,839	39,059	312,305	320,410	106,093	119,060	+ 12,967	850,442	980,812	+ 130,370
Iron, Bar, Angle, Bolt, and Rod. „	29,956	24,797	214,572	200,319	222,875	219,607	− 3,268	1,601,725	1,854,069	+ 252,344
Iron, Railroad, of all sorts..... „	56,069	39,351	321,231	295,887	394,979	324,556	− 70,423	2,246,129	2,405,375	+ 159,246
Iron, Cast ..... „	7,269	6,523	58,738	46,375	62,246	62,871	+ 625	489,534	442,700	− 46,834
Iron Hoops, Sheets, and Boiler Plates ... ...) „	14,197	9,886	89,657	83,418	169,354	144,027	− 25,327	1,033,129	1,190,820	+ 157,691
Iron, wrought, of all sorts ... „	11,403	10,315	71,801	72,380	227,130	202,942	− 24,188	1,378,212	1,496,973	+ 118,761
Iron, old, for re-manufacture ... „	571	231	11,410	5,873	1,721	1,071	− 650	42,620	28,606	− 14,014
Iron Steel, unwrought ... ... „	2,297	1,844	17,945	19,992	74,354	61,359	− 12,995	581,728	651,424	+ 69,696
Copper, unwrought, in Ingots, Cakes, or Slabs ..... cwt.	24,393	9,106	186,894	74,135	114,089	44,163	− 69,926	856,992	374,014	− 482,978
Copper, wrought or partly wrought, Bars, Rods, Bottoms, Pans, Plates, Sheets, and Nails; and mixed or Yellow Metal for Sheathing. „	52,756	62,636	372,633	340,364	240,497	301,863	+ 61,366	1,697,708	1,703,153	+ 5,445
Copper, wrought, of other sorts. „	1,234	3,494	6,802	12,235	8,474	19,023	+ 10,549	42,418	75,105	+ 32,687
Brass of all sorts ... ... „	4,108	3,068	29,082	23,777	21,016	19,090	− 1,926	145,125	132,787	− 12,338
Lead, Pig, Rolled, Sheet, Piping, Tubing, and Lead Shot ..... tons	3,475	2,204	26,106	22,605	74,147	48,571	− 25,576	562,336	498,336	− 64,000
Lead Ore, Lead, Red, and White, and Litharge of Lead ..... „	691	733	4,465	4,571	16,952	19,191	− 2,239	107,280	116,612	+ 9,332
Tin, unwrought ..... cwt.	6,587	9,098	53,344	60,627	38,709	48,298	+ 9,589	313,551	330,575	+ 17,024
Tin Plates ..... „	85,744	65,699	753,081	751,372	101,522	85,630	− 15,892	882,122	955,925	+ 73,803
Zinc or Spelter, wrought or unwrought ..... „	10,030	8,902	61,629	70,243	9,539	9,410	− 129	60,286	82,174	+ 21,888
Salt ..... tons	70,968	59,480	438,677	419,911	32,376	28,669	− 3,707	203,331	198,670	− 4,661
				£	2,327,220	2,272,380	− 54,840	16,093,859	16,857,004	+ 763,145

LONDON PRICES CURRENT OF METALS.

From Messrs. JAMES and SHAKSPEARE'S, 10, Austin Friars, E.C., 1*st October*.

			Per Ton.		
IRON	Rails	in Wales	£7 0 0	@	£7 5 0
Welch	Bars	„	—	„	7 5 0
	„		7 17 6	„	8 5 0
Staffordshire	„		—	„	9 10 0
	Nail Rods		—	„	9 10 0
	Hoops		—	„	10 10 0
	Sheets		—	„	11 10 0
Scotch	Pig (mixed Nos. warrants) in the Clyde		—	„	2 16 0
Swedish Hammered	Iron — Large sizes		—	„	12 10 0
	Iron — Indian assortments		—	„	12 5 0
	Steel — Faggot		—	„	16 10 0
	Steel — In kegs (½ and ⅝ in.)		—	„	15 10 0
			Per Unit.		
COPPER	Ore		—	@	17*s.* 9*d.*
	Regulus		—	„	17*s.* 9*d.*
	Barilla		18*s.* 6*d.*	„	19*s.* 0*d.*
			Per Ton.		
	Chili Slab (for 96°/₀ pure Copper)		—	none	—
	Spanish Cake		—	@	£87 0 0
Australian	Burra and P.C.C.		96 0 0	„	97 0 0
	Kapunda		96 0 0	„	100 0 0
	Wallaroo		96 0 0	„	97 0 0
	Cadia		96 0 0	„	97 0 0
American	Baltimore		97 0 0	„	98 0 0
	Lake Superior		—	none	—
English	Tough Cake and Ingot and Tile		93 0 0	@	98 0 0
	Best selected Ingot		96 0 0	„	101 0 0
	Sheets, Sheathing and Rod		101 0 0	„	105 0 0
	Flat Bottoms		106 0 0	„	110 0 0
			Per lb.		
YELLOW METAL	Sheets (4 × 4 feet)		8¼*d.*	@	8½*d.*
	Sheathing and Rod		8¾*d.*	„	9*d.*
			Per Cwt.		
TIN English	Common Blocks and Ingots		—	@	101*s.*
	„ Bars (in barrels)		—	„	102*s.*
	Refined		—	„	106*s.*
Foreign	Straits, Fine		—	„	98*s.*
	„ (with 3 months' prompt)		—	„	100*s.*
	Banca		—	„	100*s.*
			Per Box.		
TIN PLATES	Charcoal IC, best		29*s.* 0*d.*	@	30*s.* 0*d.*
	„ IX „		35*s.* 0*d.*	„	36*s.* 0*d.*
	Coke IC „		23*s.* 0*d.*	„	26*s.* 0*d.*
	„ IX „		29*s.* 0*d.*	„	32*s.* 0*d.*
			Per Ton.		
LEAD English	Sheet		—	@	£21 0 0
	Pig—W.B.		—	„	22 10 0
	„ Other good brands		£20 5 0	„	20 10 0
Foreign	„ (German and Spanish) soft		19 15 0	„	20 0 0
English	Red		—	„	22 0 0
	Shot		—	„	23 15 0
	Dry White		—	„	26 10 0
SPELTER	(Silesian) in Cakes		—	„	23 15 0
ZINC	(Sheet) No. 9 and upwards		—	„	30 0 0
			Per Bottle.		
QUICKSILVER (in bottles containing 75 lbs. each)			8 0 0	@	—
			Per Ton.		
REGULUS OF ANTIMONY, French Star			—	@	36 0 0

Tabular Abstract of Mining Accounts for the Month.

Date of Account.	Name of Mine, and Number of Shares.	Balances. Debit. £ s. d.	Balances. Credit. £ s. d.	Calls. Per Share. £ s. d.	Calls. Total. £ s. d.	Dividends. Per Share. £ s. d.	Dividends. Total. £ s. d.
	CORNISH & DEVON MINES.						
Aug. 18	Okel Tor (12,288)	142 6 7	—	—	—	—	—
„ 18	North Jane (6,000)	888 8 9	—	0 5 0	1,500 0 0	—	—
„ 23	Great Work (119)	—	1,141 13 9	—	—	5 0 0	595 0 0
„ 24	New Hendra (400)	15 5 11	—	0 7 6	150 0 0	—	—
„ 24	Ludcott and Wrey (4,800)	501 12 9	—	0 5 0	1,200 0 0	—	—
„ 24	Wheal Margaret (896)	1,725 0 0	—	1 0 0	896 0 0	—	—
„ 25	East Downs (?)	—	—	1 0 0	(?)	—	—
„ 26	North Great Work (6,000)	157 12 9	—	0 2 0	600 0 0	—	—
„ 26	Wheal Hearle (3,648)	701 0 0	—	0 5 0	912 0 0	—	—
„ 29	East Pool (128)	—	259 19 0	—	—	—	—
„ 29	West Kitty (5,000)	32 2 9	—	0 2 0	500 0 0	—	—
„ 29	Basset and Grylls (1,000)	187 10 6	—	0 7 6	375 0 0	—	—
„ 29	Trevenen&Treunenheere(5,600)	1,094 2 6	—	0 2 6	700 0 0	—	—
„ 30	Wheal Jane (512)	—	389 0 0	—	—	0 10 0	256 0 0
„ 30	Leeds and St. Aubyn (1,019)	484 0 0	—	—	—	—	—
„ 31	Providence (1,120)	—	1,376 10 1	—	—	1 0 0	1,120 0 0
„ 31	Mary Hutchings (1,000)	—	46 7 3	0 2 0	100 0 0	—	—
„ 31	East Abraham (9,600)	—	—	0 5 0	2,400 0 0	—	—
„ 31	West Par (19,000)	770 0 0	—	0 1 0	950 0 0	—	—
Sept. 5	South Frances (496)	—	1,329 17 11	—	—	—	—
„ 6	Pendeen Consols (5,000)	559 12 8	—	0 2 6	625 0 0	—	—
„ 6	Boscean (240)	—	81 19 7	—	—	—	—
„ 6	West Fowey (6,400)	104 9 0	—	0 2 6	800 0 0	—	—
„ 6	Esther United (6,144)	226 11 9	—	0 1 0	307 4 0	—	—
„ 6	New Pembroke (6,400)	—	199 3 7	0 1 6	480 0 0	—	—
„ 7	Trelyon Consols (572)	691 1 0	—	0 10 0	286 0 0	—	—
„ 7	Condurrow (256)	8,072 17 0	—	31 10 0	8,064 0 0	—	—
„ 7	West Jane (9,017)	—	—	0 1 6	676 5 6	—	—
„ 8	Great Busy (6,000)	—	167 0 0	—	—	—	—
„ 8	Boscawen (6,000)	721 0 0	—	—	—	—	—
„ 9	North Chiverton (6,000)	—	866 0 0	—	—	—	—
„ 12	Wheal Margery (968)	—	29 0 4	—	—	—	—
„ 13	Wheal Mary Ann (1,024)	—	2,253 8 2	—	—	0 10 0	512 0 0
„ 13	Grambler and St. Aubyn (486)	194 11 1	—	1 0 0	486 0 0	—	—
„ 13	North Roskear (700)	1,783 8 6	—	2 0 0	1,400 0 0	—	—
„ 14	East Grambler (486)	—	—	0 10 0	243 0 0	—	—
„ 14	Nanjiles (1,024)	1,650 18 1	—	1 0 0	1,024 0 0	—	—
„ 15	Great North Downs (5,000)	725 2 4	—	0 5 0	1,250 0 0	—	—
„ 15	Great Brigan (5,000)	1,085 5 10	—	0 4 0	1,000 0 0	—	—
„ 16	Great Wheal Fortune (1,798)	30 0 0	—	—	—	—	—
„ 17	Spearne Moor (280)	382 7 6	—	—	—	—	—
„ 19	West Damsel (256)	—	725 0 0	—	—	1 10 0	384 0 0
„ 19	Great Caradon (4,096)	—	28 4 9	0 2 0	409 12 0	—	—
„ 19	Emily Henrietta (1,024)	451 0 0	—	0 10 0	512 0 0	—	—
„ 19	North Buller (1,024)	43 4 2	—	0 12 6	640 0 0	—	—
„ 20	Wheal Buller (256)	—	—	2 0 0	512 0 0	—	—
„ 21	West Basset (6,000)	—	927 7 1	—	—	—	—
„ 21	Great Wheal Vor (5,908)	—	6,537 0 0	—	—	0 12 6	3,692 10 0
„ 21	West Great Work (3,500)	1,744 15 2	—	0 7 6	1,312 10 0	—	—
„ 22	West Condurrow (1,218)	318 6 3	—	0 1 3	76 2 6	—	—
„ 22	Wheal Harriet (5,120)	199 0 0	—	0 2 6	640 0 0	—	—
„ 22	East Gunnislake (4,000)	800 17 1	—	0 4 9	800 0 0	—	—
„ 23	Devon Great Consols (1,024)	—	37,461 5 10	—	—	10 0 0	10,240 0 0
„ 23	Yarner (3,097)	716 0 9	—	0 2 6	387 2 6	—	—
„ 23	Wheal Hartley (6,000)	1,444 0 5	—	0 4 10	1,444 0 5	—	—
„ 23	Carnyorth (2,048)	1,263 11 9	—	—	—	—	—
„ 23	Wheal Uny (4,096)	1,558 0 0	—	0 5 0	1,024 0 0	—	—
					34,381 16 11	—	16,799 10 0
	WELSH & OTHER MINES.						
„ 3	Nanteos (4,000)	—	942 5 0	—	—	—	—
„ 14	Great Laxey (12,500)	—	9,028 19 3	—	—	0 10 0	6,250 0 0
	FOREIGN MINES.						
„ 21	Cape Copper (15,000)	—	—	—	—	0 5 0	3,750 0 0

Copper Ores.

Sampled Aug. 17, and sold at Tyack's Hotel, Camborne, Sept. 1.

Mines.	Tons.	Purchasers.	Price.
Clifford Amalgamated	110	1	£6 12 6
	90	4, 5, 6	2 16 6
	74	1	10 15 6
	70	1, 7	9 2 0
	69	1, 5, 6, 7	2 11 0
	64	6	4 8 0
	63	7	4 11 6
	60	1	3 8 6
	47	2	4 11 0
	45	1, 6	9 16 0
(Consols)	50	2	9 10 6
	4	1	10 16 6
West Seton	93	11	5 13 6
	77	10	4 12 6
	72	9	5 15 6
	67	7	6 15 0
	54	3	4 13 6
	51	3	7 12 6
	43	10	3 3 0
	30	7, 9	9 14 0
Wheal Seton (Pendarves)	83	10	5 4 6
	76	10	4 10 0
	74	8	0 5 6
	61	5, 10	5 4 6
	60	5	7 2 6
	51	10	1 1 6
	20	10	1 13 0
	5	5	2 13 0

Mines.	Tons.	Purchasers.	Price.
South Tolgus	71	4, 6	£5 8 6
	61	5	6 7 0
	60	2, 6	6 4 0
	50	7	3 12 6
North Roskear	89	3	11 0 0
	64	7	3 1 6
	56	3	5 18 0
South Frances	44	6	6 9 6
	38	6	5 0 6
	35	4, 6	6 7 0
	31	4, 6	4 6 0
	30	2	6 1 6
Tolcarne	57	8	2 13 0
	52	7, 10	3 15 0
	45	7	2 18 0
East Pool	69	7, 12	3 13 6
	44	9	3 5 0
	23	11	3 19 0
Wheal Basset	47	1	4 15 0
	39	1, 9	3 18 6
	25	5	11 14 6
East Basset	38	7	6 16 6
	20	10	3 9 0
	17	12	14 16 6
West Stray Park	30	7, 9	5 15 6
Stevens's Ore	18	8	1 11 6
	1	8	27 3 6
Wheal Harriet	10	7	4 16 0
North Dolcoath	10	9	4 7 0

TOTAL PRODUCE AND VALUE.

	Tons.	Amount.
Clifford Amalgamated	746	£4,543 0 6
West Seton	487	2,819 14 6
Wheal Seton	430	1,643 6 6
South Tolgus	242	1,325 15 6
North Roskear	209	1,506 4 0
South Frances	178	1,013 13 0
Tolcarne	154	476 11 0

	Tons.	Amount.
East Pool	136	£487 8 6
Wheal Basset	111	669 9 0
East Basset	75	580 7 6
West Stray Park	30	173 5 0
Stevens's Ore	19	55 10 6
Wheal Harriet	10	48 0 0
North Dolcoath	10	43 10 0

EACH COMPANY'S PURCHASE.

	Tons.	Amount.
1 Vivian & Sons	389½	£2,657 13 6
2 Freeman & Co.	157	1,058 7 0
3 Grenfell & Sons	250	1,950 14 6
4 Crown Copper Co.*	—	—
5 Sims, Willyams, & Co.	228¾	1,409 6 6
6 Williams, Foster, & Co.	412½	2,118 3 3
7 Mason & Elkington	479¾	2,375 5 6
8 Bankart & Sons	150	226 18 6

	Tons.	Amount.
9 Copper Miners' Co.	175½	910 19 3
10 Charles Lambert	426¾	1,680 18 9
11 Newton, Keates, & Co.	116	618 12 6
12 Sweetland, Tuttle, & Co.	51½	378 16 3
13 Penclawdd Copper Co.	—	—
Total	2,837	£15,385 15 6

Average Produce, 6$\frac{11}{12}$ %.
Quantity of Fine Copper, 189 tons 3 cwts.
Ore required to make a ton of Fine Copper, 15 tons.

Average Price per ton of Ore..... £5 8 5½
Per Unit of Copper in Ore..... 0 16 3¾
Average Standard (nominal)..... 122 12 0

* The purchases made by No. 4 (Crown Copper Co.) are included in the total of No. 6 (Williams, Foster, & Co.), those firms being identical.

Copper Ores.

Sampled August 24, and sold at Tabb's Hotel, Redruth, September 8.

Mines.	Tons.	Purchasers.	Price.
East Carn Brea	58	2, 6	£5 10 6
	48	2, 6	3 14 0
	46	4, 6	3 6 6
	45	1, 3	7 10 6
	44	3	7 15 6
	38	1	8 1 6
	31	5	7 7 0
	29	3	5 9 6
	19	5	3 8 6
Prosper United.....	70	1, 5	1 15 6
	59	9	3 2 6
	51	9	5 8 0
	49	2	3 14 0
	42	9	4 6 0
	30	9	4 6 6
Wheal Margery	58	1, 12	2 3 6
	56	5, 3	2 4 6
	55	1, 6	6 7 6
	54	1	7 13 6
	46	1, 5	2 8 6
West Basset	67	10	4 0 6
	64	7	5 14 0
	54	7	7 3 6
	48	7	10 14 0
	26	1, 5	13 15 6
East Rosewarne	48	3	7 13 0
	43	7, 13	7 4 6
	26	5	11 5 6

Mines.	Tons.	Purchasers.	Price.
East Rosewarne	25	3	£7 12 6
	18	9	2 11 6
Treloweth	58	4, 6	4 1 6
	32	2, 6	2 18 0
	21	6	6 3 6
	20	1, 3	13 5 6
Tolvadden.....	50	10, 12	2 16 0
	49	10	3 7 6
	21	10	3 19 6
	3	3	19 12 6
Par Consols	85	3	6 9 6
Nangiles	81	7	2 13 6
	21	7	7 2 6
	20	7, 10	3 8 6
Copper Hill	41	12	1 19 6
	26	5	7 6 6
Wheal Uny	32	4, 6	5 6 0
	30	4, 6	5 11 6
Wheal Buller	58	7	3 7 6
New Rosewarne	36	13	6 5 0
North Basset	18	7	2 2 6
	9	7	9 1 0
West Trevelyan	20	1	4 12 6
Crowan Consols	12	2	2 16 0
	5	5	0 12 6
Wheal Agar (Tehidy)	15	7	6 17 0
Emily Henrietta	12	5	3 8 6
Great Wheal Fortune	11	1	8 17 6

TOTAL PRODUCE AND VALUE.

	Tons.	Amount.
East Carn Brea	358	£2,090 5 6
Prosper United.....	301	1,075 13 6
Wheal Margery	269	1,127 7 6
West Basset	259	1,893 13 6
East Rosewarne	160	1,208 0 0
Treloweth	131	724 6 6
Tolvadden.....	123	447 14 6
Par Consols	85	551 7 6
Nangiles	72	301 1 0
Copper Hill	67	271 8 6

	Tons.	Amount.
Wheal Uny	62	£336 17 0
Wheal Buller	58	195 15 0
New Rosewarne	36	225 0 0
North Basset	27	119 14 0
West Trevelyan	20	92 10 0
Crowan Consols	17	36 14 6
Wheal Agar	15	102 15 0
Emily Henrietta.....	12	41 2 0
Great Fortune	11	97 12 6

EACH COMPANY'S PURCHASE.

	Tons.	Amount.
1 Vivian & Sons	283	£1,748 17 0
2 Freeman & Co.....	130	510 6 6
3 Grenfell & Sons	266½	1,970 0 3
4 Crown Copper Co.*	—	—
5 Sims, Willyams, & Co..	218	1,180 0 6
6 Williams. Foster, & Co.	283½	1,326 11 3
7 Mason & Elkington ...	349½	2,106 3 9
8 Bankart & Sons	28	62 6 0

	Tons.	Amount.
9 Copper Miners' Co. ...	20	£816 9 6
10 Charles Lambert	172	622 15 6
11 Newton, Keates, & Co.	—	—
12 Sweetland,Tuttle,& Co.	95	214 1 0
13 Penclawdd Copper Co.	57½	380 6 9
Total	2,083	£10,937 18 0

Average Produce, $6\frac{7}{16}$ °/₀.
Quantity of Fine Copper, 134 tons 1 cwt.
Ore required to make a ton of Fine Copper, 15 tons 10 cwts. 3 qrs.

Average Price per ton of Ore £5 5 0
Per Unit of Copper in Ore..... 0 16 3½
Average Standard (nominal) 124 6 0

No Sale on Sept. 15th.

* The purchases made by No. 4 (Crown Copper Co.) are included in the total of No. 6 (Williams Foster, & Co.), those firms being being identical.

Copper Ores.

Sampled September 7, and sold at the Royal Hotel, Truro, September 22.

Mines.	Tons.	Purchasers.	Price.
Devon Great Consols.	132	3	£6 12 0
	125	4, 6	5 14 0
	123	4, 6	5 2 6
	122	4, 6	5 8 6
	119	3	5 1 0
	117	7	5 9 6
	116	2	5 9 0
	115	6	5 2 0
	110	1, 6	6 4 6
	108	4, 6, 9	5 9 6
	101	3	4 14 0
	100	11	5 15 0
	98	10	4 17 0
	87	10	2 10 6
	86	10	1 12 0
	84	11	4 11 0
	79	5	3 16 6
	72	3, 5	3 16 6
	50	3	14 11 6
	45	3	13 5 6
	41	12	2 3 6
	23	5	2 9 6
	14	5	2 14 6
	11	10	3 14 0
East Caradon	99	9	4 10 6
	91	2	5 0 6
	88	8, 13	4 7 6
	86	1	5 3 6
	54	1	7 1 6
	50	1	7 17 6
	35	1	15 5 0

Mines.	Tons.	Purchasers.	Price.
Hingston Down	97	2, 5, 9, 10	£3 0 6
	93	5, 6, 9	2 13 6
	83	5, 7	2 11 6
	72	2, 9, 10	2 8 6
	62	7	8 18 6
	58	7	4 13 0
New Wheal Martha .	85	1, 5	1 19 0
	82	1, 5	2 1 6
	65	1, 5	2 1 6
	64	1, 5	2 14 0
	63	1, 5	1 15 0
	54	1, 5	2 8 6
	42	8	1 16 6
Marke Valley	95	5	2 15 0
	87	12	2 10 0
	84	5	2 15 0
	83	5	3 2 6
	36	6	6 13 6
	25	12	1 16 6
	24	12	2 8 6
Bedford United	103	9	5 2 0
	86	2, 9	4 1 6
East Russell	54	10	5 1 6
	49	2	3 6 6
	25	1	11 12 6
Wheal Friendship ...	66	6	9 1 6
	61	12	3 4 6
Wheal Emma	62	5	2 3 6
	40	2	4 14 6
Fursden	30	9	3 2 6

TOTAL PRODUCE AND VALUE.

	Tons.	Amount.
Devon Great Consols.....	2,078	£11,005 6 6
East Caradon	503	3,044 17 0
Hingston Down	460	1,730 6 6
New Wheal Martha	455	961 8 6
Marke Valley	434	1,313 5 0
Bedford United	189	£875 15 0
East Wheal Russell	128	727 12 0
Wheal Friendship	127	795 13 6
Wheal Emma	102	323 17 0
Fursdon	30	93 15 0

EACH COMPANY'S PURCHASE.

	Tons.	Amount.
1 Vivian & Sons	511½	£2,829 19 9
2 Freeman & Co.....	387¼	1,748 3 9
3 Grenfell & Sons	483	3,410 13 6
4 Crown Copper Co.*.....	—	—
5 Sims, Williams, & Co..	779½	2,126 19 1
6 Williams, Foster, & Co.	745	4,249 19 6
7 Mason & Elkington ...	273½	1,547 4 9
8 Bankart & Sons	86	269 3 0
9 Copper Miners' Co. ...	390½	£1,653 16 8
10 Charles Lambert	384¼	1,278 17 7
11 Newton, Keates, & Co.	184	957 4 0
12 Sweetland, Tuttle, & Co.	238	607 4 6
13 Penclawdd Copper Co..	44	192 10 0
Total	4,506	£20,871 16 0

Average Produce, 5¼ °/₀.
Quantity of Fine Copper, 254 tons 6 cwts.
Ore required to make a ton of Fine Copper, 17 tons 14 cwts. 1½ qrs.

Average Price per ton of Ore £4 12 7½
Per Unit of Copper in Ore 0 16 5
Average Standard (Nominal) 130 16 0

Blende Sales.

Dates.	Mines.	Tons.	Price per ton. £ s. d.	Purchasers.	Amount of Money. £ s. d.
Sept. 2.	Minera	88	... 5 19 6 ...	Vivian & Sons	
	,, ...	25	... 5 3 0 ...	ditto	974 0 0
	,, ...	10	... 4 6 6 ...	ditto	
	,, ...	77	... 3 19 6 ...	ditto	
,, 6.	Great Laxey	200	... 4 12 6 ...	W. Kenrick	925 0 0
,, 7.	Talargoch (Coetia Llys) ..	101¼	... 4 16 6 ...	H. Southern	571 16 3
	,, (Maesyrerwddu)	33¾	... 2 9 0 ...	Vivian & Sons	

* The purchases made by No. 4 (Crown Copper Co.) are included in the total of No. 6 (Williams, Foster, & Co.), those firms being identical.

Copper Ores.

Sampled September 14, and sold at the Royal Hotel, Truro, September 29.

Mines.	Tons.	Purchasers.	Price.
Wheal Rose	107	4, 6	£4 14 0
	104	7	4 15 6
	96	4, 6, 7	4 8 6
	80	2	4 14 0
	66	3	4 7 0
	62	2	5 6 6
South Caradon	95	9	5 12 6
	90	7	5 17 0
	77	1, 6	7 17 6
	76	2, 6	7 14 6
	66	1, 5	15 3 0
	64	1	14 5 6
	43	5	13 13 0
Clifford Amalgamated	83	4, 6, 10	5 1 0
	80	5	2 5 6
	73	10	3 12 6
	72	5	2 10 6
	62	5	2 3 0
	56	5	2 10 6
	36	10	8 0 0
	24	3	4 3 0
	14	10	4 3 0
Phœnix Mines	77	12	2 11 0
	71	10	4 1 0
	62	3, 8	2 12 6
	60	5	2 8 0
	57	12	2 9 6
	55	7	4 5 0
	37	10	6 2 0
North Treskerby	63	4, 6	5 1 6
	62	4, 6	5 3 6
	61	8	2 15 6
	59	2, 3, 6	3 18 6

Mines.	Tons.	Purchasers.	Price.
North Treskerby	58	3, 9, 11	£4 18 6
	55	13	4 16 6
Great Wheal Busy	71	10	2 1 6
	68	10	3 1 0
	51	1	1 2 6
	49	2, 10	3 12 0
	31	5	2 9 0
	30	4, 6, 10	2 9 6
West Caradon	60	1	7 18 6
	59	11	6 10 0
	53	13	5 5 0
	50	6	6 18 6
	22	9	4 1 0
	14	5	1 10 0
Fowey Consols	77	1	5 19 6
	70	5	5 0 6
	66	1, 6	5 6 6
St. Day United	66	3	4 12 0
	47	12	1 4 6
	35	3	4 9 6
Wheal Polmear	66	10	3 18 0
	44	5	8 2 6
	30	10	8 0 6
Boscawen	52	2, 3, 6	2 15 0
	34	2, 6	3 2 0
	28	7	2 3 6
Gonamena	63	2	3 9 0
	17	2	3 16 0
North Downs	42	3	4 11 0
	35	4, 6	4 8 6
South Crinnis	24	6	3 13 0
Buckingham's Ore	18	12	2 3 6
East Cuddra	8	12	4 17 6

TOTAL PRODUCE AND VALUE.

	Tons.	Amount.
Wheal Rose	515	£2,417 11 0
South Caradon	511	4,754 16 0
Clifford Amalgamated	500	1,767 19 6
Phœnix Mines	419	1,391 3 6
North Treskerby	358	1,592 9 0
Great Wheal Busy	300	738 14 0
West Caradon	258	1,593 12 0
Fowey Consols	213	1,163 5 6
St. Day United	148	£517 16 0
Wheal Polmear	140	855 13 0
Boscawen	114	505 6 0
Gonamena	80	281 19 0
North Downs	77	345 19 6
South Crinnis	24	87 12 0
Buckingham's Ore	18	39 3 0
East Cuddra	8	39 0 0

EACH COMPANY'S PURCHASE.

	Tons.	Amount.
1 Vivian & Sons	356½	£2,885 8 3
2 Freeman & Co.	338½	1,547 8 2
3 Grenfell & Sons	320⅓	1,339 9 6
4 Crown Copper Co.*	...	
5 Sims, Willyams, & Co.	565	2,675 12 0
6 Williams, Foster, & Co.	643 5-6	3,294 7 1
7 Mason & Elkington	309	1,655 7 0
8 Bankart & Sons	92	250 13 0
9 Copper Miners' Co.	136½	£718 13 10
10 Charles Lambert	528½	2,229 10 4
11 Newton, Keates, & Co.	78⅛	478 14 4
12 Sweetland, Tuttle, & Co.	207	473 3 0
13 Penclawdd Copper Co.	108	543 12 6
Total	3,683	£18,091 19 0

Average Produce, 6$\frac{2}{15}$ %.
Quantity of Fine Copper, 227 tons 13 cwts.
Ore required to make a ton of Fine Copper, 16 tons 3 cwts. 2¼ qrs.

Average Price per ton of Ore £4 18 3
Per Unit of Copper in Ore 0 15 10¼
Average Standard (nominal)..... 123 19 0

* The purchases made by No. 4 (Crown Copper Co.) are included in the total of No. 6 (Williams Foster, & Co.) those firms being identical.

Copper Ores.

Sampled August 27, and sold at Swansea September 13.

Mines.	Tons.	Produce.	Purchasers.	Price. £	s.	d.
Berehaven	80	11	7	£9	5	6
	70	11¼	7	9	9	0
	121	11¼	6	9	7	0
	121	10	13	8	8	6
	108	10⅝	16	8	16	6
	87	9⅝	13	8	3	0
Cape Copper	63	31¾	6, 7	26	18	0
	62	31½	6	26	14	0
	59	31½	6	27	2	0
	58	32¼	5	27	9	0
	55	31½	5	27	10	6
	45	31½	3	27	4	0
	51	26½	6	23	6	0
	46	26½	6	23	0	0
	70	30¼	15	26	11	6
	1	52½	6	45	1	0
Cuba	105	14¼	3	12	1	0
Cuba	104	14⅛	3	£12	1	0
	16	71½	10	59	8	6
	100	14⅛	2	12	7	0
	97	14⅛	7	12	7	6
	80	14⅛	7	12	2	0
	20	22⅛	7	19	1	0
(Precipitate)	14	71	6	60	0	0
(Mantua)	64	7⅛	6	5	12	0
	43	20⅛	6	17	4	0
Burnt Ore	138	2⅛	3	2	1	0
Copper Ore	44	13⅛	7	11	13	6
British Regulus	25	23⅛	10	19	15	6
Lisbon Ore	63	21⅛	7	18	0	6
London Ore	1	53	5	47	4	0
	1	6⅛	7	5	3	6
Cappagh	45	6⅛	10	5	1	6
	10	16⅛	5	14	2	0

TOTAL PRODUCE AND VALUE.

	Tons.	Amount. £	s.	d.
Berehaven	587	£5,216	8	6
Cape Copper	510	13,430	11	6
Cuba	643	9,191	12	6
Burnt Ore	138	282	18	0
Copper Ore	44	513	14	0
British Regulus	25	£494	7	6
Lisbon Ore	63	1,135	11	6
London Ore	2	52	7	6
Cappagh	55	369	7	6

EACH COMPANY'S PURCHASE.

	Tons.	Amount. £	s.	d.
1 Copper Miners' Co.	—	—		
2 Freeman & Co.	100	£1,235	0	0
3 Grenfell & Sons	392	4,025	7	0
4 Crown Copper Co.	—	—		
5 Sims, Willyams, & Co.	124	3,294	3	6
6 Vivian & Sons	492¼	9,462	7	0
7 Williams, Foster, & Co.	486¼	6,454	13	6
8 British & For. Copper Co.	—	—		
9 Mason & Elkington	—	—		
10 Bankart & Sons	86	£1,673	11	0
11 Charles Lambert	—	—		
12 Ravenhead Copper Co.	—	—		
13 Sweetland, Tuttle, & Co.	208	1,728	9	6
14 Jennings & Co.	—	—		
15 Penclawdd Copper Co.	70	1,860	5	0
16 Mona Copper Co.	108	953	2	0
Total	2,067	£30,686	18	6

Price per Unit of Copper in British and Irish Ores, 16*s.* 8¾*d.*
British and Irish Ore required to make a ton of Fine Copper, 10 tons 5 cwts. 1¾ qr.

Price per Unit of Copper in Foreign and Colonial Ores, 17*s.* 1¼*d.*
Foreign and Colonial Ore required to make a ton of Fine Copper, 4 tons 7 cwts. 3 qrs.

NO SALE ON SEPTEMBER 27.

Black Tin Sales.

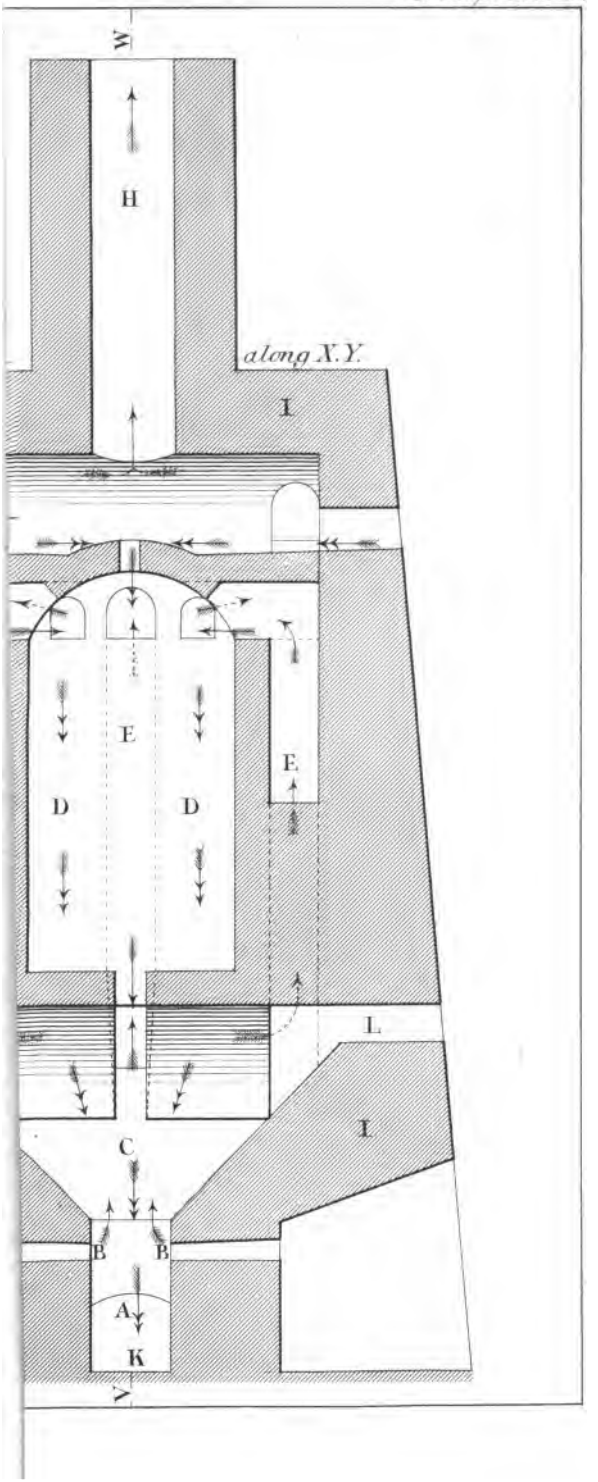
Dates.	Mines.	Tons. c.	q.	lbs.	Price per ton. £	s.	d.	Purchasers.	Amount of Money. £	s.	d.
Aug. 11.	Pendeen Consols	4 6	0	6	60	0	0	Bolitho & Sons	537	3	0
	„	4 13	0	0	60	0	0	Mitchell & Co.			
„ 27.	North Jane	1 2	3	27	58	5	0	Daubuz & Co.	66	19	3
„ 29.	Leeds and St. Aubyn	6 11	3	11	63	2	6	Chvandour	416	2	6
Sept. 2.	Cornubia	3 19	1	26	65	0	0	Daubuz & Co.	258	6	4
„ 3.	Phœnix	9 14	3	25	54	0	0	Harvey & Co.	526	8	6
	Great Wheal Busy	14 0	0	0	—			ditto	764	15	0
„ 7.	Kitty (St. Agnes)	20 7	2	23	—			ditto	1,274	1	7
	Gunnis Lake	10 15	2	23	60	0	0	ditto	647	2	4
	Basset and Grylls	20 4	0	9	—			ditto	1,201	13	6
„ 14.	Great Wheal Vor United	50 6	2	8	—			ditto	3,342	5	8
	Wheal Norris	9 3	0	11	65	0	0	Enthoven & Sons	669	4	11
	„	1 8	0	14	52	15	0	Daubuz & Co.			

Sundry Copper Ore Sales.

Dates.	Mines.	Tons.	Price per ton. £	s.	d.	Purchasers.	Amount of Money. £	s.	d.
Sept. 20.	Parys	155	6	6	0	Mona Co.	1,953	0	0
	„	155	6	6	0	ditto			
„ 21.	Knockmahon (ex Bridget)	105	4	7	0	Newton, Keates, & Co.	929	5	0
	„ „	105	4	10	0	ditto			

Lead Ore Sales.

Dates.	Mines.	Tons.	Price per Ton. £	s.	d.	Purchasers.	Amount Money. £	s.	
Aug. 27.	Isle of Man Mining Co.	100	15	6	6	Walker, Parker, & Co.	1,532	10	
„ 29.	East Logylas	70	13	11	0	A. Eyton	948	10	
	Glogfach	70	17	18	0	Sims, Willyams, & Co.	1,253	0	
	Cwmystwith	60	13	18	0	ditto	1,660	10	0
	„	60	13	15	6	Panther Co.			
„ 30.	Newtownards	45	13	15	0	Sims, Willyams, & Co.	618	15	0
„ 31.	Minera Union	50	14	2	0	ditto	705	0	0
Sept. 2.	Minera	100	14	8	0	ditto			
	„	100	14	8	0	ditto			
	„	100	14	5	0	ditto			
	„	51	14	5	6	Newton, Keates, & Co.	7,360	11	0
	„	100	14	10	0	Sims, Willyams, & Co.			
	„	26	14	8	0	Brymbo Co.			
	„	35	14	7	6	ditto			
„ 3.	Wheal Mary Ann	40	28	7	6	Treffry's Trustees	1,603	15	0
„	„	30	15	12	6	R. Michell & Son			
„ 6.	Great Laxey	100	25	10	0	Stock & Co.	2,550	0	0
	North Devon	40	12	15	6	Falmouth Co.	511	0	0
„ 8.	Talargoch (Maesyrerwddu)	22½	14	14	0	Newton, Keates, & Co.	2,737	0	0
	„ (Coetia Llys)	154	15	12	6	Walker, Parker, & Co.			
	Deep Level	15	13	11	6	ditto	203	12	6
	Brynford Hall	6	13	12	0	Newton, Keates, & Co.	81	12	0
	Rhosesmor	55	14	1	6	ditto			
	„	27½	13	18	6	A. Eyton	1,540	0	0
	„	27½	13	18	6	Walker, Parker, & Co.			
	Parry's	8½	14	3	6	A. Eyton	240	19	6
	„	8½	14	3	6	Walker, Parker, & Co.			
	Bryn Gwiog	45	15	2	0	A. Eyton	679	10	0
	Long Rake	25	14	1	6	Walker, Parker, & Co.	351	17	6
	Billins	15	14	6	6	Newton, Keates, & Co.	164	17	6
	Speedwell	5	12	13	6	ditto	63	7	6
	Pennant	10	14	0	0	A. Eyton	140	0	0
	Pantne	3	13	13	0	Newton, Keates, & Co.	40	19	0
	Dog Pit	11	13	2	6	Brymbo Co.	144	7	6
	North Henblas	15	13	3	6	Walker, Parker, & Co.	197	12	6
	Pool Park	20	14	16	6	ditto	296	10	0
	Penrychyn	21	14	0	0	Brymbo Co.	294	0	0
	Llanerchyraur	7½	14	5	6	A. Eyton	107	1	3
	Havan	50	13	19	0	Sims, Willyams, & Co.	697	10	0
	Wheal Frank Mills	90	12	15	0	Stock & Co.	1,147	10	0
„ 9.	Cargoll	63	17	17	0	R. Michell & Son	1,124	11	0
„ 12.	East Darren	75	17	1	6	Panther Co.	1,280	12	6
	Cwm Erfin	25	16	17	6	ditto	1,070	6	0
	„	37	17	10	6	ditto			
„ 14.	Minera Boundary, &c. (blue ore)	30	13	14	0	Brymbo Co.	411	0	0
„ 15.	Roman Gravels	15	14	4	6	Walker, Parker, & Co.	213	7	6
	Dyfngwm	12	13	13	6	ditto	164	2	0
„ 16.	Isle of Man Mining Co.	100	25	2	6	A. Eyton	2,512	10	0
„ 19.	Nanty	55	14	16	6	Walker, Parker, & Co.	815	7	6
„ 22.	Mount Pleasant	4	14	0	6	Newton, Keates, & Co.	56	2	0
	Hendre Ucha	13	14	3	6	A. Eyton	184	5	6
	Bryngwyn	10	14	8	6	ditto	144	5	0
	Caeconroy	8½	15	0	0	Newton, Keates, & Co.	127	10	0
	Dyfngwm	14	13	13	6	ditto	191	9	0
„ 26.	East Logylas	50	13	7	6	Panther Co.	668	15	0
	Glogfach	40	18	0	6	Newton, Keates, & Co.	721	0	0
	Goginan	30	18	13	0	ditto	559	10	0
	Cwmystwith	60	13	17	6	Sims, Willyams, & Co.	1,660	10	0
	„	60	13	16	0	ditto			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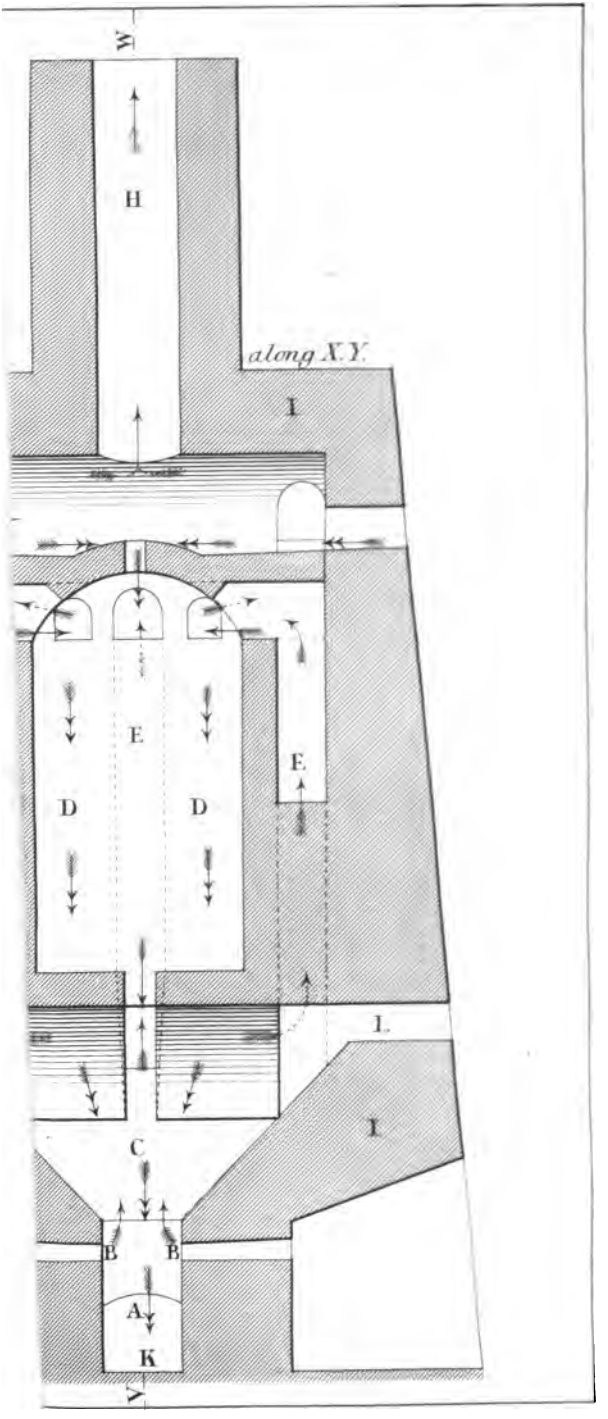
Lead Ore Sales.

Dates.	Mines.	Tons.	Price per Ton. £ s. d.	Purchasers.	Amount of Money. £ s. d.
Aug. 27.	Isle of Man Mining Co.	100	15 6 6	Walker, Parker, & Co.	1,532 10 0
„ 29.	East Logylas	70	13 11 0	A. Eyton	948 10 0
	Glogfach	70	17 18 0	Sims, Willyams, & Co.	1,253 0 0
	Cwmystwith	60	13 18 0	ditto	1,660 10 0
	„	60	13 15 6	Panther Co.	
„ 30.	Newtownards	45	13 15 0	Sims, Willyams, & Co.	618 15 0
„ 31.	Minera Union	50	14 2 0	ditto	705 0 0
Sept. 2.	Minera	100	14 8 0	ditto	7,360 11 0
	„	100	14 8 0	ditto	
	„	100	14 5 0	ditto	
	„	51	14 5 6	Newton, Keates, & Co.	
	„	100	14 10 0	Sims, Willyams, & Co.	
	„	26	14 8 0	Brymbo Co.	
	„	35	14 7 6	ditto	
„ 3.	Wheal Mary Ann	40	28 7 6	Treffry's Trustees.	1,603 15 0
„	„	30	15 12 6	R. Michell & Son	
„ 6.	Great Laxey	100	25 10 0	Stock & Co.	2,550 0 0
	North Devon	40	12 15 6	Falmouth Co.	511 0 0
„ 8.	Talargoch(Maesyrerwddu)	22¾	14 14 0	Newton, Keates, & Co.	2,737 0 0
	„ (Coetia Llys)	154	15 12 6	Walker, Parker, & Co.	
	Deep Level	15	13 11 6	ditto	203 12 6
	Brynford Hall	6	13 12 0	Newton, Keates, & Co.	81 12 0
	Rhosesmor	55	14 1 6	ditto	1,540 0 0
	„	27½	13 18 6	A. Eyton	
	„	27½	13 18 6	Walker, Parker, & Co.	
	Parry's	8¾	14 3 6	A. Eyton	240 19 6
	„	8¾	14 3 6	Walker, Parker, & Co.	
	Bryn Gwiog	45	15 2 0	A. Eyton	679 10 0
	Long Rake	25	14 1 6	Walker, Parker, & Co.	351 17 6
	Billins	15	14 6 6	Newton, Keates, & Co.	164 17 6
	Speedwell	5	12 13 6	ditto	63 7 6
	Pennant	10	14 0 0	A. Eyton	140 0 0
	Pantne	3	13 13 0	Newton, Keates, & Co.	40 19 0
	Dog Pit	11	13 2 6	Brymbo Co.	144 7 6
	North Henblas	15	13 3 6	Walker, Parker, & Co.	197 12 6
	Pool Park	20	14 16 6	ditto	296 10 0
	Penrychyn	21	14 0 0	Brymbo Co.	294 0 0
	Llanerchyraur	7¼	14 5 6	A. Eyton	107 1 3
	Havan	50	13 19 0	Sims, Willyams, & Co.	697 10 0
	Wheal Frank Mills	90	12 15 0	Stock & Co.	1,147 10 0
„ 9.	Cargoll	63	17 17 0	R. Michell & Son	1,124 11 0
„ 12.	East Darren	75	17 1 6	Panther Co.	1,280 12 6
	Cwm Erfin	25	16 17 6	ditto	1,070 6 0
	„	37	17 10 6	ditto	
„ 14.	Minera Boundary, &c. (blue ore)	30	13 14 0	Brymbo Co.	411 0 0
„ 15.	Roman Gravels	15	14 4 6	Walker, Parker, & Co.	213 7 6
	Dyfngwm	12	13 13 6	ditto	164 2 0
„ 16.	Isle of Man Mining Co.	100	25 2 6	A. Eyton	2,512 10 0
„ 19.	Nanty	55	14 16 6	Walker, Parker, & Co.	815 7 6
„ 22.	Mount Pleasant	4	14 0 6	Newton, Keates, & Co.	56 2 0
	Hendre Ucha	13	14 3 6	A. Eyton	184 5 6
	Bryngwyn	10	14 8 6	ditto	144 5 0
	Caeconroy	8½	15 0 0	Newton, Keates, & Co.	127 10 0
	Dyfngwm	14	13 13 6	ditto	191 9 0
„ 26.	East Logylas	50	13 7 6	Panther Co.	668 15 0
	Glogfach	40	18 0 6	Newton, Keates, & Co.	721 0 0
	Goginan	30	18 13 0	ditto	559 10 0
	Cwmystwith	60	13 17 6	Sims, Willyams, & Co.	1,660 10 0
	„	60	13 16 0	ditto	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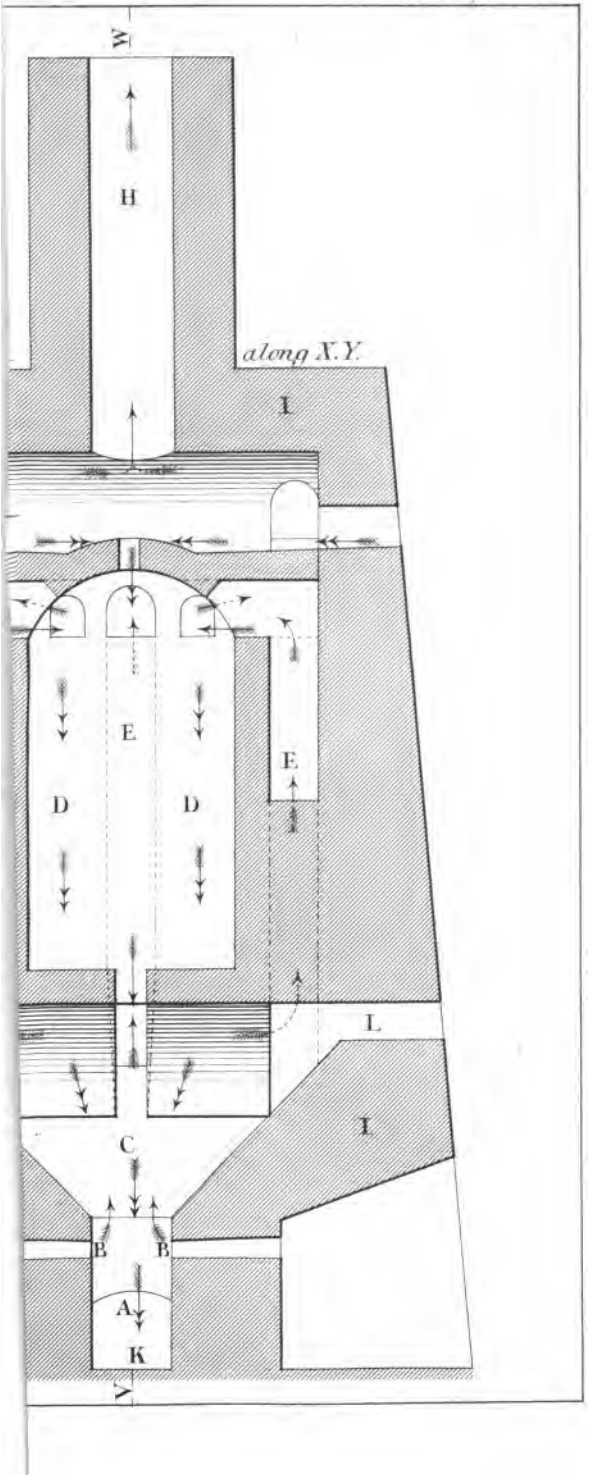
Lead Ore Sales.

Dates.	Mines.	Tons.	Price per Ton. £	s.	d.	Purchasers.	A		
Aug. 27.	Isle of Man Mining Co.	100	15	6	6	Walker, Parker, & Co.	1,5		
„ 29.	East Logylas	70	13	11	0	A. Eyton	9		
	Glogfach	70	17	18	0	Sims, Willyams, & Co.	1,2		
	Cwmystwith	60	13	18	0	ditto	1,660		
	„	60	13	15	6	Panther Co.			
„ 30.	Newtownards	45	13	15	0	Sims, Willyams, & Co.	618		
„ 31.	Minera Union	50	14	2	0	ditto	705		
Sept. 2.	Minera	100	14	8	0	ditto			
	„	100	14	8	0	ditto			
	„	100	14	5	0	ditto			
	„	51	14	5	6	Newton, Keates, & Co.	7,360	11	6
	„	100	14	10	0	Sims, Willyams, & Co.			
	„	26	14	8	0	Brymbo Co.			
	„	35	14	7	6	ditto			
„ 3.	Wheal Mary Ann	40	28	7	6	Treffry's Trustees.	1,603	15	0
„	„	30	15	12	6	R. Michell & Son			
„ 6.	Great Laxey	100	25	10	0	Stock & Co.	2,550	0	0
	North Devon	40	12	15	6	Falmouth Co.	511	0	0
„ 8.	Talargoch (Maesyrerwddu)	22¼	14	14	0	Newton, Keates, & Co.	2,737	0	0
	„ (Coetia Llys)	154	15	12	6	Walker, Parker, & Co.			
	Deep Level	15	13	11	6	ditto	203	12	6
	Brynford Hall	6	13	12	0	Newton, Keates, & Co.	81	12	0
	Rhosesmor	55	14	1	6	ditto			
	„	27½	13	18	6	A. Eyton	1,540	0	0
	„	27½	13	18	6	Walker, Parker, & Co.			
	Parry's	8½	14	3	6	A. Eyton			
	„	8½	14	3	6	Walker, Parker, & Co.	240	19	6
	Bryn Gwlog	45	15	2	0	A. Eyton	679	10	0
	Long Rake	25	14	1	6	Walker, Parker, & Co.	351	17	6
	Billins	15	14	6	6	Newton, Keates, & Co.	164	17	6
	Speedwell	5	12	13	6	ditto	63	7	6
	Pennant	10	14	0	0	A. Eyton	140	0	0
	Pantne	3	13	13	0	Newton, Keates, & Co.	40	19	0
	Dog Pit	11	13	2	6	Brymbo Co.	144	7	6
	North Henblas	15	13	3	6	Walker, Parker, & Co.	197	12	6
	Pool Park	20	14	16	6	ditto	296	10	0
	Penrychyn	21	14	0	0	Brymbo Co.	294	0	0
	Llanerchyraur	7¼	14	5	6	A. Eyton	107	1	3
	Havan	50	13	19	0	Sims, Willyams, & Co.	697	10	0
	Wheal Frank Mills	90	12	15	0	Stock & Co.	1,147	10	0
„ 9.	Cargoll	63	17	17	0	R. Michell & Son	1,124	11	0
„ 12.	East Darren	75	17	1	6	Panther Co.	1,280	12	6
	Cwm Erfin	25	16	17	6	ditto	1,070	6	0
	„	37	17	10	6	ditto			
„ 14.	Minera Boundary, &c. (blue ore)	30	13	14	0	Brymbo Co.	411	0	0
„ 15.	Roman Gravels	15	14	4	6	Walker, Parker, & Co.	213	7	6
	Dyfngwm	12	13	13	6	ditto	164	2	0
„ 16.	Isle of Man Mining Co.	100	25	2	6	A. Eyton	2,512	10	0
„ 19.	Nanty	55	14	16	6	Walker, Parker, & Co.	815	7	6
„ 22.	Mount Pleasant	4	14	0	6	Newton, Keates, & Co.	56	2	0
	Hendre Ucha	13	14	3	6	A. Eyton	184	5	6
	Bryngwyn	10	14	8	6	ditto	144	5	0
	Caeconroy	8½	15	0	0	Newton, Keates, & Co.	127	10	0
	Dyfngwm	14	13	13	6	ditto	191	9	0
„ 26.	East Logylas	50	13	7	6	Panther Co.	668	15	0
	Glogfach	40	18	0	6	Newton, Keates, & Co.	721	0	0
	Goginan	30	18	13	0	ditto	559	10	0
	Cwmystwith	60	13	17	6	Sims, Willyams, & Co.	1,660	10	0
	„	60	13	16	0	ditto			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THE

MINING AND SMELTING MAGAZINE.

NOVEMBER, 1864.

The Metallurgical Processes of the Mansfeld Copper Works.

By Albrecht von Groddeck, Metallurgical Engineer, of Stolberg, near Aix-la-Chapelle.*

(*Continued from page* 139.)

4. *Accessory Appliances:*

Blowing Apparatus and Mains.—The blowing apparatus of the raw smelting works consist of the old form of bellows, of blowing-cylinders, of Cagniardelles, and of fans.

Bellows.—At the Friedeburger works, wooden bellows are still used for supplying air to the raw smelting furnaces, a pair of bellows being provided for each furnace. One water-wheel, 13′ in diameter, and 3′ 3″ breast, works 4 bellows, each 12′ long by 1′ 3½″ broad in front, and 3′ 8″ at the back. With 4·4 discharges of each bellows per minute, the 4 pair used for the 4 furnaces at these works furnish 780 cubic feet of air, which, allowing 10% for loss, leaves about 700 cubic feet, which gives for each furnace, or for every pair of bellows, 175 cubic feet of air per minute.

Cylindrical Blowing-engines.—At the Kupferkammer works there is a double-acting cylindrical blowing-engine, with 3 cylinders of 4′ diameter and 3½′ stroke. With from 3 to 4 double strokes per minute, it delivers 1,200 cubic feet of air at a pressure equal to a column of water from 6″ to 8″ in height, or 200 cubic feet of air per twyer and nozzle. The blowing-engine receives its motion from a water-wheel 15′ in diameter and 11′ 4″ breast. A cast-iron main, of 8″ interior diameter, conveys the air first to the heating-stoves and then to the furnaces. At the Kreutzhütte, there are two cylindrical

* Abstracted from the *Berg- und Hütten. Zeit.*, Nos. 8, 11, 17, 23, 27, 32, 38, 40, &c., 1864.

blowing-engines, with 2 and 3 cylinders respectively, each engine being set in motion by a water-wheel 20′ in diameter. The cylinders are respectively 42″ and 45″ in diameter, and 3′ stroke. With 28 and 36 single strokes respectively the cylinders deliver 1,800 cubic feet of air, so that each of the four *Grossöfen* receives 450 cubic feet of air per minute at a pressure equal to a column of water 11½″ in height. The main is so arranged that each of the four furnaces can be supplied with blast from either engine. At the Sangerhäuserhütte there is a blowing-engine with 3 cylinders, each of 3′ 2″ diameter and 4′ stroke, which, with 5 strokes per minute, deliver 1,000 cubic feet of blast.

Cagniardelle.—At the Eislebener and Eckardt works the Cagniardelle is used. The Cagniardelle at the Oberhütte is 14′ long, 8′ diameter, and has 3 spirals. It is set in motion by a 20′ water-wheel, and with 5 revolutions per minute it delivers 700 cubic feet of blast with a pressure of 6·4‴ of quicksilver. It usually makes 7 revolutions per minute and delivers 1,200 cubic feet of blast, so that each *Grossofen* receives 400, and each *Kleinofen* 200 cubic feet of blast. The Cagniardelle at the Mittelhütte differs little from that at the Oberhütte.

At the Eckardt works there are two Cagniardelles, each 13′ long and 10′ in diameter. With 7½ revolutions per minute each of the 5 *Grossöfen* receives 468 cubic feet of blast per minute, at a pressure equal to a column of water from 7″ to 8″ in height. Both these Cagniardelles are set in motion by one water-wheel, 30′ in diameter, and 5′ breast in the clear. Another similar pair of Cagniardelles are in course of construction. When the intended reconstruction of the Kupferkammer works is completed the cylindrical blowing-engine will be replaced by Cagniardelles.

Fans.—At the Kupferkammer and Eckardt works fans are kept as a reserve blowing-apparatus.

Comparison of the various Blowing-Apparatus.—From the result of the enquiry held in 1856 as to the improvements of the raw smelting works, it appeared that in using the Cagniardelle only 1 H. P. was required in treating 1,000 *fudern* of schist in 48 working weeks; while at the Kreutzhütte, where cylindrical blowing-engines were used, 1⅔ H. P. was required for treating an equal quantity of materials in the same time. A similar result was obtained at the Kupferkammer works, where, according to the working returns for the years 1860 and 1862, 3,600 *fudern* were treated, requiring a water-power of 7 H. P., or 1·66=1⅔ H. P. per 1,000 *fuder*. At the Friedeberger works, the results with the common bellows were still more unsatisfactory; for according to the working returns for the years 1860 and 1862, the 2,000 *fudern* treated per year, required a motive power of 4·52 H. P., equal to 2·25 H. P. per 1,000 *fudern*. This clearly establishes the superiority of the Cagniardelle compared with any other blast-apparatus.

Heating Stoves.—At the old Friedeburger works cold blast is still used, but at all the other works (excepting the Eckardthütte) a considerable saving of fuel has been effected by heating the blast; and at the Eckardt works heating stoves are in course of construction.

At the raw smelting works, the ovens are on what is known as the box or pipe arrangements, and are heated either by a separate fire-grate on which lignite is burnt, or by the waste gases from the concentration reverberatory furnaces. At the Kreutzhütte there are two box-ovens, with 20 and 25 boxes respectively, heated by a separate fire-place in which the blast is raised to 1,000° Cent. (1832° Fahr.) At the Kupferkammer works, the heating stove consists of 30 cast-iron pipes, arranged in 5 rows of 6 pipes each, each row joined by cast-iron sockets, and heated by a separate fire-grate. A similar apparatus is in use at the Sangerhäuserhütte. At the Oberhütte and Mittelhütte box ovens are used, heated by lignite. But at the Mittelhütte, in the large flue that conveys the products of combustion from the reverberatory furnace to the stack, there are, besides, 4 long wrought-iron pipes, of a semi-circular section, in which the blast is heated during the working of the furnace. At both these latter works the blast is heated to from 120° Cent. (248° Fahr.) to 150° Cent. (300° Fahr.)

5. *Working Results:*

Production.—The quantity and quality of the ore-furnace regulus obtained, per *fuder* of charge, varies according to the nature of the schist treated. From the working returns for 1860, it appears that there was obtained, per *fuder* of charge:

	Ctrs.		Pfd.		Pfd.	
At the Mansfelderhütte	5·2	of ore-furnace regulus, containing	33	of Cu &	0·190	Ag.
„ Eislebenerhütte	4·5	„ „	35·3	„	0·195	„
„ Kupferkammerhütte...	5·5	„ „	26·3	„	0·139	„
„ Friedeburgerhütte ...	5·0	„ „	22·04	„	0·121	„
„ Sangerhäuserhütte ...	6·14	„ „	45·86	„	0·098	„

According to the working returns for 1862, the quantity of *Schweel* and residua obtained, per *fuder* of schist, was:

	Ctrs.		Ctrs.
At the Mansfelderhütte	2·5	At the Kupferkammer and Friedeburgerhütte	3·0
„ Eislebenerhütte	2·4		

The quantity of bear obtained at these works was from 0·10 to 0·15 centners. At the Sangerhäuserhütte the quantity amounted to 0·5 centners per *fuder* of charge.

Consumption of Fuel.—According to the working returns for 1860 and 1861, the fuel required, per *fuder* of schist smelted, for the heating, &c. of the furnaces, was from ·05 to ·1 *tonne* of charcoal at all the works except those of Kupferkammer and Friedeburger where the consumption was from ·02 to ·1 *schock* of wood. The consumption of coke per *fuder* of schist, and with hot and cold blast, in the smelting at the different works was as follows:—

		Tonne.		Tonne.	
Eckardthutte	cold blast	6·5 English	or Westph., or	7·8	Gas.
Kreutz	hot „	5·0	ditto	6·0	„
Kupferkammer ...	hot „	5·5	ditto	6·5	Gas or Wettiner.
„ ...	cold „	6·5	ditto	7·5	„
Eislebener	hot „	5·25	hard	6·5	soft.
Sangerhaüser.....	hot „	7·0 English (with charge in new proportions).			
Friedeburger	cold „	.....		7·5	soft.

By which it will be seen that a saving of about 1 to 1½ *tonne* of coke, per *fuder* of schist treated, is effected by the application of the hot blast.

Comparing the figures before given of the proportion between the weight of the charges and of the fuel, with these figures, it will be seen that 1 Pfd. of coke will smelt:

With soft coke	and	hot blast	7 to 8	Pfd.	of charge.
„ ditto	„	cold „	6 to 6½	„	„
„ hard coke	„	hot „	6 to 7	„	„
„ ditto	„	cold „	5 to 5½	„	„

At the Sangerhäuserhütte, with hot blast, 1 Pfd. of hard coke will only smelt 5 Pfd. of charge in consequence of its greater infusibility.

Time Consumed.—The time consumed in smelting 1 *fuder* of schist varies with the size of the furnace, the motive power applied, and the fusibility of the charge. The smelting of this quantity consumes, at the respective works, the periods of time given below in connection with the capacity of the furnaces in cubic feet.

With *Grossöfen:*

Sangerhäuser ...	hot blast ...	12 to 14 hours	...	cub. ft.	capacity.		
Eislebener ...	hot „ ...	8·4	„	206	„	„	
Kupferkammer	hot „ ...	6·5 to 7·7	„	97	„	„	
Kreutz ...	hot „ ...	5 to 6·6	„	362	„	„	
Eckardt ...	cold „ ...	6·5 to 7·7	„	362	„	„	

With *Kleinöfen:*

Eislebener ...	hot „ ...	16·8	„	68	„	„	
Kupferkammer	hot „ ...	10·5	„	54	„	„	
Friedeburger ...	cold „ ...	14	„	54	„	„	

The furnaces are in work from 45 to 50 weeks in the year, without taking into account any time spent in trifling repairs. The acid slags formed in these raw smelting furnaces allow of long working periods, as they are not liable to form projections in the furnace. At the Eckardthütte, when I was there, a furnace had already been in blast for two years, and seemed likely to continue so for some time longer.

On the other hand, the duration of the furnace workings at the Upper and Lower Harz works is very short, owing to the basic nature of the slags. The time the furnaces remain in blast at the Kupferkammer and Friedeburger works is much shorter than at the other raw-smelting works, on account of the large quantity of furnace-calamine formed.

Workmen.—For each furnace there are, per shift, 2 smelters, 1 charger, and 1 assistant. There is one man to each pair of furnaces to supply the coal.

Wages.—The wages of the workmen are fixed on a scale which has been determined by the time which experience has shown to be required in the operations. Each furnace has to return a definite

allotted weekly production, called its "week's work." This amounts to, at the following works:—

Kreuzhutte.....	per	*Grossofen*,	30 *fuder*.	Kupferkammer	per	*Kleinofen*,	21 *fuder*.
Eckardthütte ...	„	„	28 „	Ditto	„	„	11 „
Eislebener	„	„	20 „	Sangerhäuser...	„	*Grossofen*,	11 „
Ditto	„	*Kleinofen*,	10 „	Friedeburger	„	„	11 „

In reality the weekly produce is greater than this, for while the men receive a fixed rate of wages for the allotted production, they receive a premium for each *fuder* above this. At each of the works the whole of the wages earned are divided proportionately among the men.

6. *Roasting the Ore-Furnace Regulus:*

Object.—The roasting of the ore-furnace regulus is the essential operation preparatory to the concentration. It has, however, happened that, for the purpose of keeping the Gottesbelohnungshütte uninterruptedly at work, the poor ore-furnace regulus has, in consequence of the scarcity of concentration-regulus, been desilverised without previous roasting or concentration.

Choice of Method.—It has been attempted to roast the ore-furnace regulus on a grate in a blast-furnace, but the usual difficulties supervened. (The author does not know why kilns are not used as in the Lower Harz.) At present, after removing the *Schweel* which adheres to it, the regulus is weighed into parcels of 100 centners each, and roasted either in open heaps, in piles, or in closed-furnaces so as to utilise the sulphuric acid.

Roasting in Open Heaps.—The roasting in open heaps is at present carried on at the Eckardthütte in the ordinary manner, until the sulphuric acid manufactory is put in work. At the Kreutzhütte, from want of space, the roasting is partly carried out in open heaps on ground in front of the works.

Roasting in Piles.—At those raw smelting works at which the ore-furnace regulus is concentrated—with the exception of the Eckardthütte where the regulus is roasted in closed furnaces—there are merely piles in numbers proportionate to the size of the works. The piles are arranged either in a row, side by side (Kreutzhütte), or in two opposite rows (Kupferkammerhütte). They are simply enclosed by walls built of rough stone or slag, and without draught holes. Their dimensions vary; most of them are from 10′ to 12′ broad, about 10′ deep, and 5′ to 6′ high. In roasting in piles the regulus is broken into pieces the size of the fist, and thrown on to a foundation of logs of wood. The open side of the pile is closed up with bears, and on to the inner side of the wall thus formed charcoal is thrown in. The pile is covered in by the fine smalls, resulting from the breaking up of the regulus, which is moistened, and the draught regulated by holes made in it. In filling up the front wall, an opening is left close to the ground—the eye—though which red-hot slag is thrown in to light the pile. The first roasting lasts from 1 to 2 weeks. After cooling the well-roasted portions are separated, and those not sufficiently roasted are done over again.

Experience in concentrating the roasted regulus has shown that at the Mansfelder and Eislebener works from 50 to 70 % of the whole quantity has to be roasted twice, one roasting only sufficing for from 30 to 50 %. The two kinds thus obtained are treated together. At the Kupferkammer works from 85 to 90 % is roasted twice, and from 10 to 15 % once. The regulus that is to be roasted a second time is previously broken up, so as to present a larger surface to the oxidising influence; and, on account of the small sulphur contents, in order to raise the temperature sufficiently high, a layer of charcoal is introduced into the pile, thicker or thinner according to the degree to which it is desired to carry the roasting.

The second roasting usually lasts longer than the first. Well roasted regulus has a bluish-black dull appearance; it often clots or sinters together, but is friable and easily disintegrates. In order to roast 100 centners of regulus, there is required from 1½ to 2 *tonne* of charcoal, and from 1½ to 2 *schock* of wood. The roasting operation, including the cooling, lasts from 2 to 8 weeks, during which the regulus becomes from 10 to 15 % heavier, in consequence of the absorption of oxygen. The author is not in a position to give any special description of the roasting in closed furnaces, on account of the difficulty of gaining admission into the sulphuric acid manufactory at the Kupferkammer works.

7. *The Concentration-Smelting:*

Object.—The object of the concentration process and the method of carrying it out, have been already sufficiently described.

Working Arrangements.—In order to concentrate the roasted ore-furnace regulus, there are two reverberatory furnaces at the Kupferkammerhütte, one at the Eckardthütte (where a second is also being built), and one at the Mittelhütte. At the Gottesbelohnungshütte there is a reserve reverberatory furnace, in case the others should be insufficient for the demand. It has been used in the experiments made for roasting the schist in reverberatory furnaces.

The foundations of the furnaces are of Zechstein: those of the older ones are quite solid, but the newer furnaces, at the Eckhardthütte, have a channel underneath, the better to carry off the moisture. The interior form of the furnaces has been often modified. In the older furnaces the hearth had an exactly oval form; but in the newer ones, at the Eckardthütte, the hearth narrows towards the flue, giving it something the shape of a blow-pipe flame. This form has however been modified, as, with such a construction, the flue became very strongly heated while the furnace itself remained cold.

In working the furnaces with a flat fireplace a mixture of lignite and coal is used. At the Kupferkammer works unsuccessful attempts have been made to economise fuel by using lignite alone, with an inclined fireplace. Under and over the fire-bridge, an air-flue used formerly to be constructed, so as to introduce at pleasure an oxidising action into the furnace if the charge should prove too rich in sulphur. In the newer furnaces, however, these flues have been abandoned, it having been found that they were not successful in meeting the difficulty.

The fire-bridge is constructed solidly of fire-brick; it ends off in a bow-shape form, and is covered with a layer of quartz-sand, from 3″ to 4″ thick, which can be easily renewed. As the fire-bridge is in the hottest part of the furnace, and therefore is easily attacked by the regulus, an iron plating, bent to its form, is built in over it.

The hearth has somewhat the form of a trough, with a slight inclination towards the tap-hole. In order to carry off any moisture, a layer, an inch thick, of ore-furnace slag is spread over the foundation, and upon that a layer, from 6″ to 8″ thick, of heated mortar-sand. The hearth itself is composed of a mixture of 8 parts of stamped quartz-sand, previously calcined, and 1 part of stamped slag. This mixture is melted on it, in layers from 2″ to 3″ thick. Two openings lead to the hearth: one, the slag-hole, is opposite the fire-bridge, and from it rises the flue; the other, the working-door, is opposite the tap-hole. In front of the tap-hole is a gutter of sand-stone, down which the concentration regulus flows into the granulating pit. For the protection of the workmen this pit is surrounded with barriers; it is usually 10′ long, 5′ broad, and 3½′ deep.

The furnaces are secured by wrought-iron standards, 3″ thick and 1½″ broad, which are held together by strong tie-bars, 1½″ square. The arch of the furnace is supported by cast-iron plates, 1″ thick and 10′ high, which are fastened round the furnace at a corresponding height, and are held together by the tie-bars of the furnace.

Working of the Furnaces.—The hearth of the furnace is composed, as before stated, of quartz-sand, with which is mixed stamped slag. If the roasted regulus, which contains large quantities of sulphur-metals and FeO, were to be smelted immediately on this hearth, it is evident that the latter would soon be destroyed, and it is therefore necessary to melt a slag-hearth over the quartz-sand. After the quartz-sand hearth is completed, highly silicated slags are melted on it, and partially tapped off again. During the working of the furnace care must be taken so that on the one hand this slag-hearth does not melt off—in which case the hearth would be destroyed—and on the other hand that the furnace is kept sufficiently hot to prevent it cooling down, and thus increasing the thickness of the hearth so as to alter the dimensions of the furnace. The maintenance of the hearth is the principal thing in the working of reverberatory furnaces. In stirring up the charge with the rabble, the workman—as we shall see further on—must be able to judge of the nature of the hearth by the feel, and must regulate his working accordingly. The maintenance of the hearth is of the same importance in reverberatory furnace working as the guiding of the nose is in blast-furnace working.

Charge.—The chief point in concentration smelting is to combine the FeO and SiO^3 formed during the roasting, and to remove them as slag. As the roasted ore-furnace regulus does not contain SiO^3 in any considerable quantity, it must be added to the charge in the form of flux. Quartz-sand, poor sand-ores, and slag, serve as fluxes. According to the working returns of 1860 and 1862 there were required per 100 centners of ore-furnace regulus:—

At the Eislebenerhütte 8 to 10 centners of quartz-sand.
„ „ Mansfelderhütte 10 „ „ sand-ores or 12 cubic feet of sand.
„ „ Kupferkammerhütte 10 „ „ „ „ 10½ „ „ „

After the silicic acid, the sulphur contained in the charge plays the most important part. Owing to the unequal results of the roasting when conducted in piles, there are no means of judging of the amount of sulphur contained in the ore-furnace regulus before it is smelted. Experience in smelting has shown that, in order to regulate the working, the once-roasted and the twice-roasted regulus must be mixed. If the charge contains too little sulphur more once-roasted regulus is added, but if it contain too much sulphur, twice-roasted regulus is added. We shall refer further on to the phenomena which occur with too much or too little sulphur.

Charging.—The mixture of once-roasted and twice-roasted regulus is charged in quantities varying from 50 to 80 centners in one charge (as at the Eckardthütte and Mittelhütte), or in two charges of from 38 to 42 centners following each other (as at the Kupferkammerhütte and Kreutzhütte), with corresponding quantities of sand, sand-ores and slag. At the Eckardthütte the charge consists of 60 centners of regulus and 6 centners of sand-ores. At the Kreutzhütte, 80 centners of regulus are charged in two portions, with 1 *tonne* of sand-ores. At the Kupferkammerhütte 2 charges, of 38 centners each, are put in one after the other with from 2 to 3 centners of sand, and 4 centners of slag. The regulus which has been roasted in the closed furnaces at the sulphuric acid manufactory is charged in quantities of 50 centners at a time, as its pulverised condition does not allow of its being divided.

The charging is effected by means of flat ladles, and is a tedious operation generally occupying an hour. At the Kupferkammer works, to avoid this it was attempted to charge the furnace by hoppers, but this turned out to be impracticable as it was found impossible to distribute the regulus equally over the hearth, and with a due regard to any parts that had been repaired. This method was therefore abandoned, although the charging by ladles occupies more time and naturally allows a greater cooling of the furnace.

The large pieces are put in at the bottom, and the small thrown over them. At the various works opinions differ greatly as to the best method of charging. Charging in two portions has naturally the advantage of saving time and fuel, but on the other hand it has the disadvantage that when the second cold portion is charged into the melted mass, crusts are formed, the removal of which increases the labour.

The Melting Down.—When the charging is completed the furnace-doors are closed and well stopped up; the grate is cleaned and fresh fuel put on. In order to facilitate the melting down—that is to bring the quartz into frequent contact with the FeO and to prevent, as much as possible, the former from clotting or sintering—the whole charge is thoroughly stirred after about 2 hours. By this means also the unmelted masses are prevented from accumulating on the hearth. The stirring is repeated 2 or 3 times as

required. In about 8 hours the mass has become perfectly fluid, and a considerable quantity of slag has collected on the surface of the already enriched regulus.

The First Skimming of the Slag.—To facilitate the enrichment of the regulus by the formation of fresh slag, that already formed must be removed. To effect this the slag-door is opened, an iron waggon strewn with sand is placed in front of it, and the slag is drawn into it by an iron rake.

Characteristics of the Furnace Working.—Before continuing the description of the smelting process, it will be necessary to consider the phenomena which occur in stirring the charge and in drawing off the slag. The most essential constituents are, as before stated, the SiO^3 and the sulphur. The further the roasting is carried the more the sulphur contents of the regulus decrease and its basic contents (FeO and CuO or Cu^2O), increase; so that, with a highly-roasted regulus, to obtain a properly silicated slag, a larger quantity of SiO^3 must be added as flux than is necessary with a less-roasted regulus. The first question to be asked is what kind of slag is required to be produced.

The slag must answer two requirements. It must allow of the hearth being kept in a proper condition during the process, and it must separate easily from the regulus, and skim off clean. These requirements are best fulfilled by a singulo-silicate of protoxide of iron.

If the charge has been made up in such a manner that this kind of slag is formed, the hearth is found to have a viscous condition so that during the stirring of the charge the workman can feel the quartz-hearth beneath the viscous slag-hearth. When skimmed off, the slag flows evenly and not too thin on the slag-plate, showing a development of bubbles. But if too much twice-roasted regulus is put into the charge, so that—with the same content of $Si\ 0^3$—the basic contents are greater than the sulphur contents, a sub-silicate is formed which is very difficult to smelt, and which generally gives rise to accumulations in the slag-hearth; in which case the quartz-hearth cannot be felt when the charge is stirred, and on skimming the slag flows off unevenly and in lumps—difficulties which can obviously be avoided by the addition of once-roasted regulus. On the other hand, if too much once-roasted regulus is put into the charge, a too highly silicated and very fluid slag is formed. In this case the hearth easily melts off, and can no longer be felt over the quartz-hearth on stirring the charge. When this slag is skimmed off, there is danger that, owing to its fluidity, regulus will be drawn off with it. This can of course be remedied by the addition of twice-roasted regulus.

Further Operations.—If the charge is made in two portions, the second portion is added after the first skimming of the slag. The furnace doors are closed, and in 3 hours so much slag has formed that it is necessary to draw it off again. After the firing has been kept up for an hour the slag is skimmed off a third time, and proofs are taken to ascertain if the regulus has arrived at the desired condition. The fracture of the proof must be smooth, and of a bluish-grey colour. When the proof shows the desired qualities, the regulus is tapped.

Tapping.—As the concentration-regulus has to be pulverised for the next roasting, it is tapped into water in the usual manner and granulated.

Products.—The products obtained are:—granulated copper-regulus, which is finely pulverised in mills; and concentration-slag, which is utilised in the raw-smelting.

Produce.—From 100 centners of ore-furnace regulus there is obtained, according to its quality, from 34 to 65% of concentration-regulus, and from 70 down to 46% of concentration-slag. The concentration-regulus contains from 64·7 to 69·6% of Cu, and ·34 to ·55% of silver.

Consumption of Fuel.—The fuel required per 100 centners of ore-furnace regulus at the various works, is as follows:—

	Tonne		*Tonne*		
At the Kreutz	12·8	of lignite and	12·4	of coal	
„ „ Mittel	11·6	„ „	9·6	„	with Eislebener regulus.
„ „ „	13·3	„ „	10·1	„	with Sangerhaüser ditto.
„ „ Kupferkammer	11·9 to 12·6	„	13 to 12·1		

Time Consumed.—In 24 hours from 105 to 110 centners of ore-furnace regulus are concentrated. The furnaces are at work from 34 to 36 weeks during the year.

Wages.—The workmen are paid in a similar manner to that already described as adopted in the raw smelting process. Each furnace has its allotted week's task, amounting, according to the size of the furnace, to from 700 to 800 centners. If it produces more, a premium is paid for each centner over. Each furnace is served by three men during a twelve-hours shift.

(*To be continued.*)

British Association for the Advancement of Science.

THIRTY-FOURTH MEETING, AT BATH.

INCREASE OF VOLUME OF ROCKS.

IN the paper read by Dr. Daubeny before the Geological Section, On the Extrication of Carbonic Acid from the Interior of the Earth, and its Chemical Action, he objected to the theory of Professor Bischof, referred to by Sir Charles Lyell in his inaugural address, which attributes the elevation and dislocation of certain rocks to an increase of volume, caused by the decomposition of felspar through the agency of carbonic acid; a theory founded on the fact that the products of the decomposition of granite possess a lower specific gravity, and therefore occupy more space, than the original materials of the rock. Dr. Daubeny admitted that such would be the case if the carbonic acid acted on the rocks at a temperature below 212°;

but above that temperature the opposite result would obtain. As the Doctor considered the latter condition as inevitable according to his and (as he supposed) also according to Bischof's theory of the generally volcanic origin of carbonic acid, he deemed Bischof's elevatory hypothesis to be inconsistent with the chemical facts. In this, however, Dr. Daubeny is wholly mistaken, for he confounds his own theory of the generally volcanic origin of carbonic acid, with that of Bischof's, which is really entirely different, as Bischof does *not* attribute the origin of carbonic acid, to any great extent, to volcanic action.

NEW METHOD OF EXTRACTING GOLD FROM AURIFEROUS ORES.

The paper of Mr. F. Crace Calvert, F.R.S., of Manchester, on this subject, commenced by stating that, at the present time, when the auriferous ores of Great Britain are attracting public attention, it may be advantageous to persons interested in gold mining, to be made acquainted with a new and simple method of extracting gold from such ores, which presents the advantages of not only dispensing with the costly use of mercury, but of also extracting the silver and copper which the ore may contain. Further, it may be stated that the process can be profitably adopted in cases where the amount of gold is small, and the expense of mercury consequently too great. Without entering into all the details of the numerous (about one hundred) experiments made some years since, before Mr. Calvert finally arrived at this new method of extracting gold, he stated a few preliminary facts which are necessary to give a complete view of the subject. If 2·2 parts of pure and finely divided gold, obtained by the reduction of a salt of that metal, be added to 100 parts of pure sand, and placed in a bottle with a saturated solution of chlorine gas for 24 hours, only 0·5 of gold is dissolved. If the same experiment be repeated, but, instead of chlorine water, a mixture of chlorine water and hydrochloric acid be used, 0·6 of gold is dissolved. If, instead of employing hydrochloric acid and chlorine gas, a mixture of sand, reduced gold, and peroxide of manganese, with hydrochloric acid, are placed in a bottle, 1·4 of gold is dissolved; so that it would appear that, under the influence of nascent chlorine, the gold is more readily dissolved than when the same gas is mixed in solution with hydrochloric acid, previously to being placed in contact with the auriferous sand. Still these processes leave a great deal to be desired in a commercial point of view, as more than a third of the gold remains undissolved. The same results are obtained if the chlorine gas be generated by another method, viz., by adding to the auriferous sand a mixture of chloride of sodium, sulphuric acid, and peroxide of manganese. Being convinced, therefore, that nascent chlorine gas was a fit and proper agent for cheaply extracting gold from ores, and that it was probably only necessary to modify the method of operating, Mr. Calvert allowed the mixture of hydrochloric acid and peroxide of manganese, or of sulphuric acid, per-oxide of manganese and chloride of sodium, to remain for twelve hours in contact with the auriferous sand; and, then, instead of washing out the solution of gold, he added a small quantity of water, which removed a part of the acting agent, and this was made to percolate several times through the sand; by which method he succeeded in extracting from the sand, within a fraction, the whole of the gold. Mr. Calvert then repeated

the last experiments with natural auriferous quartz, and easily extracted the two ounces of gold per ton which it contained. He therefore proposes the following plan for extracting the gold on a commercial scale:—The finely-reduced auriferous quartz should be intimately mixed with about one per cent. of peroxide of manganese; and (if common salt be used) this material should be added at the same time as the manganese, in the proportion of three parts of salt to two of manganese. The whole should be then introduced into closed vats, having false bottoms, upon which is laid a quantity of small branches covered with straw, so as to prevent the reduced quartz from filling the holes in the false bottom. Muriatic acid should then be added if manganese alone is used, and diluted sulphuric acid if manganese and salt have been employed, and, after having left the whole in contact for twelve hours, water should be added so as to fill up the whole space between the false and true bottoms with fluid. This fluid should then be pumped up and allowed to percolate through the mass, and after this has been done several times, the fluid should be run off into separate vats for extracting the gold and copper that it may contain. To effect this, old iron is placed in it to precipitate the copper; and after this has been removed, the liquor is heated to drive away the excess of free chlorine, and a concentrated solution of sulphate of protoxide of iron, or green copperas, must be added, which, acting on the gold solution, will precipitate the gold in a metallic form. By this method both gold and copper are obtained in a marketable condition. If silver is present in the ore, a slight modification in the process will enable the operator to obtain this metal also. It is simply necessary to generate the chlorine of the vitriol, manganese, and chloride of sodium process, taking care to use an excess of salt, that is, six parts instead of three, as above directed. The purpose of this chloride of sodium being to hold in solution any chloride of silver that may have been formed by the action of the chlorine on the silver ore, and to extract the metal, the following alteration in the mode of precipitation is necessary. Blades of copper must be placed in the metallic solutions, to throw down the silver in a metallic form, then blades of iron to throw down the copper, the gold being then extracted, as previously directed. Mr. Calvert thinks the advantages of this process are, 1st, cheapness; 2nd, absence of injury to the health of the persons employed; 3rd, that not only is the metallic gold in the ore extracted (as is done by mercury), but that it attacks and dissolves all gold which may be present in a combined state, besides enabling the miner also to extract what silver and copper the ore may contain.

STATISTICS RELATIVE TO THE BRISTOL COAL-FIELD.

In the absence of Mr. Handel Cossham, a paper by him was read on this subject, in which he stated that the whole Bristol coal basin within the limits of the Mountain Limestone ridge, extending from Wickwar on the north, to the Mendip Hills on the south, contains about 150 square miles, two-thirds of which lie on the south, or Somersetshire side of Bristol, but being so largely covered up by overlying strata of Lias, New Red Sandstone, and even the Oolitic Limestone, it has been much less worked, and is not so well understood as many of our other coal fields. The northern portion of the Bristol coal field, around Kingswood Hill, has probably been worked for 300 or 400 years, and in the district of Moorwood and Vobster, adjoining the Mendip Hills, there are evidences of very ancient and extensive mining operations.

He gives the supposed thickness of the coal measures of this district, with the number of workable seams, and the probable quantity yet to work. His estimate is that—

Above the Pennant there are				Tons to Work.
	4 seams,	area	5 square miles	80,000,000
In the Pennant	3	,,	8 ,,	10,000,000
Kingswood series ...	15	,,	25 ,,	600,000,000
Ashton	3	,,	15 ,,	100,000,000
	25			740,000,000

This is after allowing for faults, waste, coal out of reach, &c. It is more difficult to estimate the quantity to be worked on the Somersetshire side, but he states that he is clearly within the mark by putting it at 1,000,000,000 tons; this gives 1,700 years as the probable duration of the Bristol coal field at the present rate of production. As to the quantity at present raised in the Bristol coal field, he thinks the total quantity is about 1,000,000 tons; namely, 550,000 tons on the northern side, and 450,000 tons on the Somersetshire side. This forms about one-eightieth part of the total quantity raised in the United Kingdom, which is estimated at 80,000,000 tons, and there is no doubt that the Bristol coal field is capable of affording a much greater yield than it now produces, provided more capital and skill are brought to bear upon its development. Bristol ought to be, and it is hoped will soon become, one of the finest shipping ports for coal and iron in the kingdom. One of the main hindrances to the progress of mining operations in the neighbourhood of Bristol, has been the want of shipping arrangements for export trade; this is now in course of being remedied. Mr. Cossham estimates the number of men and boys employed in and about the collieries round and north of Bristol, at 3,750, and, as previously shown, the quantity of coal raised in the northern portion of the Bristol coal field is about 550,000 tons a year; this gives about 150 tons per man and boy engaged, or only half the average yield of the country per head. The most of this difference is doubtless due to the thinness of the seams, and the high angle at which they are wrought; but part of it is no doubt due to the want of skill in working the mines, and the non-application of horse power under ground, and the more general adoption of machinery. Mr. Cossham believes that by the application of more mechanical appliances, with more skill in the arrangement of machinery, and the laying out of the works, together with an improved system of ventilation, the quantity raised per head can be increased from 150 tons a year to at least 200, or possibly 250 tons. As to the rate of wages paid in the district for coal working, he believes he can say with truth that no classes of labourers have so much advanced in their earnings during the last fifteen years as colliers. The advance in wages in this district during that period is from twenty to twenty-five per cent. Fifteen years ago the average wage for colliers was 2*s*. 4*d*. a day, or 14*s*. a week. It is now 3*s*. a day and above. This is for a nominal day's work of eight hours, and practically for less on the average than six hours' labour a day. It must be quite evident, therefore, that the condition of the working miners of this district has vastly improved, although much remains to be done. In conclusion, with regard to the accidents in the mining operations of the district. The number of fatal accidents in all the mines of the United Kingdom, is about 1,000 annually, or 1 for every 80,000 tons of coal raised. Mr. Cossham has not had time to collect all the statistics relative to the fatal accidents of this district connected with

mining, and can only speak relative to those in his own mines, which during the last 10 years have averaged one killed for every 100,000 tons raised, or one-fifth less (20 per cent.) than the average for the whole country. This is the more satisfactory as at present nearly double the number of hands are employed to raise the same quantity of coal that is found necessary in other districts.

MODE OF WORKING THE BATH FREESTONE.

Mr. J. Randell, in a paper on this subject read before the Geological Section of the British Association, after referring to the geological position of this Freestone, stated that the first question to determine is whether the stone shall be reached by open or underground workings, and this must depend upon the presence and conditions of the upper ragstones (*and forest marble*, where they exist), as they must of necessity be passed through, unless the stone can be reached by tunnelling on the face of an escarpment, where the beds are vertically exposed, or by driving a level to cut the beds; but if the desired beds are not too much covered, open workings are resorted to. In the workings at Box and Corsham one uniform system of getting or working the stone prevails throughout the quarries, and this system is an inversion of the mode of working coal. The coal miner undercuts his coal, that the mass may fall and break, but building-stone so worked would make a valueless rubbish-heap. The freestone miner or quarryman has to commence his operations at the roof of the stone. This picking operation is effected by means of adze-shaped picks, on the heads of which longer handles are inserted as the work proceeds, and the men thus make their drivings a distance of six or seven feet back into the rock. The width or span of these stalls must of course depend on the soundness of the rock. In the Corsham workings, they can, without danger, be driven a width of from 25 to 35 feet. In the Box quarries, where the rock is not so sound, and the capping bed not so regular, the drivings are limited to from 12 to 20 feet. This is, of course, regulated by the space that may be safely opened without danger to the working beneath. It must be evident to you, that the removal of eight or nine inches of the rock immediately under the ceiling deprives the overlying strata of the support of this area of stone as effectually as its removal throughout, from roof to floor, would do, and any tendency to settle or drop is at once determined, and any risk of life thus guarded against. Another process, by a fresh agency, is now called into exercise, for the cutting of the rock into blocks of required dimensions; for this, a one-handled saw is used. These saws are worked in lengths of four, five, six, and seven feet, and are made broad, or rather deep at the head or extreme point, so as to ensure the saw sinking to its work at that point. The saw is worked in first horizontally, dropping a little as the cut goes on, and after the rock is thus opened down to the next natural parting, and the block thus separated laterally from the parent rock, levers are introduced into the bed or parting at the bottom of the block, and these levers are weighted and shaken till the block is forcibly detached at the back. It is then drawn down by crane power, and the broken end and the bed dressed with the axe, so as to make the block shapely; it is then placed on a trolly, and allowed to run to the loading platform. After the first block is removed, it will be evident to you that the workmen have then access by that opening to the back of the bank of stone, and they avail themselves of this to work the saw transversely, which, separating the block from

its back or hinder attachment, renders all further breaking off unnecessary, so the first block of each face is the only stone broken from the rock. By the removal of the first stratum a sufficient space is obtained to allow the workmen an entrance under the roof; and vertical cuts are again carried down through the next bed to the parting below, and transverse cuts readily made; meanwhile, the cutting is continued in the picking bed, the upper layer removed as before, and everything below this point quarried away, with all the sides of the block sawn, except the bed on which it has rested, and those abutting on the natural joints; hence each block comes out ready to pass into the hands of the builder, sculptor, or dealer, and this with much less cost, and less loss in waste, than formerly attended blasting, and other powerful but rough modes of extraction. The continued repetition of these several operations produces a terrace or step-like profile, in the workings, extending from the highest to the lowest of the beds worked on, and thus they present themselves to the view.

REMAUR'S PORCELAIN.

Mr. A. Noble, in a paper on Remaur's Porcelain, stated that his only reason for introducing the subject to the members of the Chemical section of the British Association was that circumstances had put him in possession of some exceedingly beautiful illustrations of a certain curious property respecting the devitrification of glass. A drinking-glass produced, which was made of ordinary flint glass, had been buried in fine sand, and exposed to the heat of a pottery kiln, by Mr. Septimus Powell, of the Temple-gate Pottery, Bristol. The kiln was about 40 hours getting to its full heat, and three or four days more in cooling. Mr. Powell had observed that ordinary "black-bottle" glass does not devitrify as readily as the "bright" metal, or light green glass; and window-glass he has not succeeded in devitrifying at all. These observations confirm previous ones, by Dumas, and others, that glass containing the greatest number of bases is the most readily devitrified. Other specimens exhibited showed similar results. They were masses of the bright metal obtained from the Glass-works of Messrs. Powell & Ricketts, Bristol, where one of Siemen's regenerative gas furnaces has been introduced, in which the glass that overflows the pots is caught in pockets at the end of the furnace, and where, by the frequent addition of fresh melted glass, the temperature is maintained for a long time, perhaps several weeks, at a low red heat. After the furnace had cooled down, the solid glass was removed from the pockets, and contained a great deal, in which a distinct crystallisation may be seen—the radiation started from various points.

Abstracts and Reviews.

THE PRODUCTION AND APPLICATION OF ALUMINIUM.

In the transactions of the Prussian *Verein für Gewerbefleiss* a memoir of Dr. Wedding has recently been published on this subject, from which we abstract the following.

This metal was first produced by Wöhler, in 1827, in the shape

of a grey powder, and subsequently, in 1845, in small metallic globules. In 1854 the French chemist Sainte-Claire-Deville produced it in sufficient quantity to allow of medals being struck from it, but at the present time its manufacture has made such progress that the price, which was at first 270 thalers (40*l.*) per lb., is now reduced to about 18 thalers (2*l.* 14*s.*) per lb., in the two principal markets for this article—Paris and Newcastle-on-Tyne.

Of the large number of minerals in which aluminium occurs as a more or less essential constituent, the metal can be extracted from comparatively few. Among these may be mentioned—clay, cryolite, and Bauxite. In extracting the metal from clay, in which the alumina is chemically combined with silicic acid, and also frequently mechanically mixed with metallic oxides—especially peroxide of iron—it has been found best first to produce ammonia-alum, which, being a salt that crystallises well, may be easily obtained free from iron and silicon. By heating the ammonia-alum, pure alumina is obtained, from which is produced, first, a double compound of chlorine and sodium, and then from this the metal aluminium.

The mineral cryolite, which is found in Greenland in large quantities and in a very pure state, is a haloid-salt very analogous to this double compound, except that the chlorine is replaced by fluorine. After H. Rose, in 1855, had called attention to this mineral it soon came to be exclusively used in the production of aluminium. But, in the practical treatment of this ore, it was found that the metal could only be obtained directly from the purest pieces, the large mass of it being only applicable for obtaining pure alumina, which had to be subsequently treated in the manner already described.

Consequently the discovery, near Avignon, about two years ago, by M. Deville, of a new aluminium ore, named Bauxite,* was one of very great practical importance. This ore occurs as a fine-grained, brick-red mass,† containing numerous dark-brown particles, and consists of a mixture of hydrated alumina, hydrated peroxide of iron, and some silica; the alumina amounting on an average to 60 per cent. The pure alumina is obtained from the ore in the most simple manner by heating the raw ore with soda in a reverberatory furnace to a red heat, but without smelting it. By this a combination of soda and alumina is formed, soluble in water, out of which the alumina can be precipitated by means of silicic acid. The alumina thus obtained is used in getting a double compound of chlorine and sodium, by mixing and heating it with common salt and coal-dust or coal-tar; for the heating of these materials together results in the formation of a volatile salt having the composition $Al^2 Cl^3 Na Cl$, which passes off into condensation-chambers. This salt, which is analogous to the purest cryolite, is then introduced, together with metallic sodium, into a reverberatory furnace, previously heated to a dull red heat. Under this temperature the sodium combines with the chlorine or with the fluorine, and metallic aluminium is thrown down, the chloride or fluoride of sodium being simultaneously slagged off. This slag, however, is found to be insufficient to protect the aluminium from the impurities of the furnace-walls, and it has therefore been necessary to add a flux, for which purpose cryolite has in every instance been found to answer best. The metal and the slag separate very easily and completely, and both can be tapped off into iron vessels.

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* See *Mining and Smelting Magazine*, Vol. IV., p. 99.

† Specimens of Bauxite may be seen at the Museum of Practical Geology, Jermyn Street, London.—Ed. M. & S. M.

The sodium required for this process is prepared at the aluminium works themselves, by mixing 30 parts of calcined soda with 13 parts of coal and 5 parts of carbonate of lime. This mixture is heated in wrought-iron tubes, and the volatile sodium passes into vessels which are filled with heated petroleum.

As regards the application of the metal aluminium in the Arts, Dr. Wedding considers that its low specific gravity—2·56 to 2·67—combined with its other properties which ally it more or less nearly to the precious metals, render it suitable for many purposes for which these latter would be too heavy and too costly. Its power of conducting electricity is 8 times as great as that of iron; and it can be drawn into the finest wire, and beaten into the thinnest sheets. The difficulty of soldering it has also lately been overcome by Mourey, of Paris, who readily effects this by a mixture of zinc and aluminium. Of the alloys of aluminium, those with copper are the most important. The one specially mentioned by Dr. Wedding has already been described in this MAGAZINE (see Vol. III., p. 106), to which description we refer our readers interested in it.

Dr. Wedding also remarks that as Bauxite was formerly smelted as an iron ore, some of the brown iron ores treated in Prussia and elsewhere may be found to contain hydrated alumina; indeed he is of opinion that it is only necessary to direct sufficient attention to this point to discover an ample supply of suitable aluminium ores.

THE GEOLOGICAL MAGAZINE.

The Geological Magazine, or Monthly Journal of Geology. Edited by T. Rupert Jones, F.G.S., Professor of Geology in the Royal Military College, Sandhurst; Assisted by Henry Woodward, F.G.S., F.Z.S., of the British Museum. London: Longman & Co.

The numbers that have already appeared of this magazine more than justify the highest expectations we could have entertained from the reputation and experience of Mr. Rupert Jones. They include several valuable original articles, and numerous important translations and abstracts of Foreign works and memoirs, with many admirable reviews. The review department, indeed, is worthy of special notice from the judgment, discrimination, and candour with which it is handled. In class publications there is always a danger of criticism falling to the dead level of a uniform feeble laudation; and therefore the frank and healthy, but still not harsh or bitter, criticism which we have in the *Geological Magazine* is the best possible evidence that it aims at a higher standard. There is no doubting the fact that men of the world have been to some extent repulsed by the flood of rather coarse laudation which second and third rate scientific men, especially geologists, seem to delight in mutually pouring on each other; particularly when, judging from private expressions of opinion, it would not appear to be always very sincere. Clearly, in geology we want a little good, wholesome, honest criticism, and this there seems every likelihood of our getting from the editorship of Mr. Jones.

Among matters within our special province that have appeared in the first four numbers we may mention a paper on the Copper Bearing Rocks of Alderly Edge, by Mr. Edward Hull, of the Geological Survey, and several interesting notices in Dr. Phipson's Notes on Foreign Geology and Mineralogy.

The getting up of the Magazine, both in typography and illustration, is perfect. The woodcuts and lithographs are equal to anything that has appeared in the most costly scientific works.

METALLIC MINES COMMISSION.

The Royal Commissioners appointed to inquire into the condition of all mines in Great Britain to which the provisions of the Act 23 & 24 Vict. c. 151 do not apply, and to suggest the most practicable means of improving the health and safety of persons employed in such mines, have just issued their report, signed by Lord Kinnaird, Sir Phillip de Malpas Grey Egerton (M.P. for South Cheshire), Mr. Nicholas Kendal (M.P. for East Cornwall), Mr. Edward Frederick Leveson Gower (M.P. for Bodmin), Mr. John St. Aubyn (M.P. for West Cornwall), Mr. Richard Davey (M.P. for West Cornwall), Dr. Edward Headlam Greenhow (Fellow of the College of Physicians), and Mr. Phillip Henry Holland (of the Burial Acts Office, Home Office).

On the present occasion we can only find space for a synopsis of the Report, and a verbatim reproduction of the resolutions. From the latter, however, our readers will see that those who expected any great results from the Commission will be happily disappointed. The resolutions are, in fact, little more than commonplaces, in which every one would, as a matter of course, concur. That this should be the result of an inquiry, pursued with such zeal by so keen a philanthropist as Lord Kinnaird, must be a matter of sincere congratulation to all connected with metallic mining, either as employers or workmen. Whether the Government will attempt to introduce any legislative measures on such a very slender case is, we should think, very doubtful.

The Report is accompanied by very full Appendices, and illustrated by several drawings, including a section of Dolcoath mine showing the temperature of the deeper levels, and a drawing of the Man-engine taken from a cut in Vol. I. of this MAGAZINE.

SYNOPSIS OF REPORT.

CORNWALL. ... ... —Health of Miners.
Vital Statistics.
Access and Egress.
Ventilation.
Accidents (Blasting, Falling away from Ladders, Falling from one Level to another, Falls of Rock, Fall of Stuff, Bursting of Boilers, Abandoned Shafts).
General Observations (Changing Houses, Wages, Candles, Clubs, Doctors, Food, Cottages, Surface work: Employment of women and children.

DEVONSHIRE. ... ... —Access and Ventilation.
Health.
General Observations (Changing Houses, Clubs, and Doctors, Cottages).

LEAD MINES OF YORKSHIRE AND THE NORTHERN COUNTRIES.—Health of Miners.
Vital Statistics.
Access and Egress.
Ventilation.
Accidents (Blasting, Falling away from Ladders and Stemples, Falling from one Level to another, Falls of the Rock, Fall of Stuff in Drawing Shafts, Bursting of Boilers, Abandoned Shafts).
General Observations (Changing Houses, Candles, Clubs, Doctors, Food, Cottages, Children).

WALES AND SHROPSHIRE.—Health of Miners.
Vital Statistics.
Ventilation.
Accidents (Falling from Ladders, Falling from one Level to another, Falls of the Rock, Bursting of Boilers, Abandoned Shafts and Workings).
General Observations (Changing Houses, Clubs, Doctors, Cottages).

SOUTH WALES. ... ... —Ventilation.
Accidents.
General Observations (Changing Houses, Cottages, Wages).

CHESHIRE.

DERBYSHIRE.

IRONSTONE MINES NOT OF THE COAL MEASURES, NEAR REDCAR, FURNESS ABBEY, AND WHITEHAVEN.

RESOLUTIONS.

I. *That there is a great excess of sickness and mortality amongst metalliferous miners, which is mainly attributable to the imperfect ventilation of the mines.*

However diverse the opinions of medical men may be as to the causes of the disease called "miners' asthma" or "miners' consumption," there is a remarkable concurrence among all the writers on the subject in this, that the health of the miner is greatly influenced by the quality of the air in which he works. The more extended inquiry instituted by us under the Royal Commission gives strength, if not certainty, to this conclusion. In the coal districts, where, on account of the dangerous gases, great attention has been given to the proper ventilation of the mines, the mortality (accidents excepted) among the miners is considerably less than it is in the metalliferous districts. We have on this account thought it advisable to make ourselves acquainted with the systems of ventilation usually adopted in coal mines, in the hopes that we might thereby be able to offer some suggestions for improving the ventilation in the metalliferous mines. The main object to be kept in view in ventilating a mine is to conduct a sufficient supply of pure air through the mine in order to displace the vitiated air where the men are at work. Various contrivances have been put in practice for effecting this, but they are all applications of two principles, propulsion and extraction; by the first pure air is forced in; by the second foul air is drawn out. The power used may be either natural or artificial Natural force acts when columns of air are, in the absence of any artificial means, of unequal weight, in which case the heavier column displaces the lighter, and so causes movement and change of air. Another natural force acts when the wind blows in at a level or over a shaft. Artificial propulsion is effected by various applications of machinery and other contrivances, such as falling water, the water blast or the fan; artificial extraction, by suction or by furnace heating. The most simple method of ventilation is by natural agencies, directed and supplemented by engineering skill. Two or more shafts or adits are essential, so contrived that one shall be upcast in all states of the weather. A system of trunk ventilation being thus established the pure air may be guided to any part of the mine where it may be required, if care be taken to remove all refuse or "deads," and to close up all old and abandoned workings, by which the currents of air may be interfered with. In cases where natural ventilation is insufficient, artificial means must be resorted to, and of these it appears to us that by far the most effectual, where it can be adopted, is that which is generally in use in the coal mines, namely, the rarefaction of the air in one of the shafts by the heat of a furnace. The mechanical means which have been suggested are the introduction of pure air by a force pump, and the abstraction of foul air by a suction pump. Machines for the latter purpose are in successful operation in some collieries and mines in this country.

The foregoing remarks chiefly apply to the maintenance of a regular system of trunk ventilation. In small mines, and in certain parts of large mines, a good supply of air may be provided by means of contrivances which cannot be economically applied on a large scale, such as different descriptions of air pumps,

water blasts and fans. These may answer the purpose when judiciously applied and carefully attended to. It appears to us worthy of consideration whether some combination of natural with artificial appliances might not be adopted at a comparatively small expense, considering the benefit that would thence accrue both to the employer and employed. Cases have come before us of mines in which, in certain conditions of the atmosphere, the circulation of air underground is regular and sufficient, while at other times it varies both in quantity and direction, consequent upon the inversion or stagnation of the current of air in the shaft. This evil might be effectually conquered by the maintenance of a constant upcast shaft, and where natural causes fail, this might be effected by an application of furnace heating. Whatever system, however, may hereafter be adopted, it is essentially necessary that attention should be paid to driving the levels of sufficient size, to making more frequent communication between them, to removing the refuse, closing up disused winzes, sumps, shafts, and abandoned workings, and to the judicious application of air-tight doors and brattices so as to control the direction of the underground currents.

II. *That several other causes, both general and local, largely contribute to impair the health of the miner; namely, exposure to cold and wet, and to sudden alternations of temperature; wearing wet clothes; inhalation of gritty particles; and the exertion of climbing ladders from great depths.*

Amongst the causes enumerated by the medical men as tending to impair the health of the miner, exposure to sudden alternations of temperature and to wet and cold is much insisted upon. The miner is peculiarly liable to these dangers, either from imprudence on his own part, or from want of proper arrangements on the part of his employers.

Another cause most injurious to the health of the miners is the exertion of climbing ladders continuously from great depths. The evidence of the medical witnesses and of the miners themselves leaves no doubt on our minds as to the pernicious effects of severe climbing upon men whose constitutions are, perhaps, impaired by the conditions under which they work, and the severity of the work itself. This evil is occasionally enhanced by the impure state of the air in the ladder ways, and aggravated by the indiscretion of the miners themselves, especially the younger ones, in mounting the ladders with too much haste.

In those mines where the man engine has been in operation, the improvement in the health of the miners is stated to be evident.

In most coal mines workmen are conveyed up and down the shaft in the "cages." This arrangement appears to us to be expeditious and safe, when due attention is paid to the construction and supervision of the machinery; and we think it might be advantageously introduced in many of the metalliferous mines.

We therefore recommend,—

1. THAT EVERY MINE SHOULD BE PROVIDED WITH PROPER HOUSES CONVENIENTLY SITUATED IN WHICH THE MEN CAN CHANGE AND DRY THEIR CLOTHES.
2. THAT SURFACE WORK SHOULD, AS FAR AS PRACTICABLE, BE CARRIED ON UNDER SHELTER, AND THAT SUITABLE PLACES SHOULD BE PROVIDED IN WHICH THE WOMEN AND CHILDREN EMPLOYED AT THE MINES MIGHT TAKE THEIR MEALS.
3. THAT IN ORDER TO AVOID THE EVILS CONSEQUENT ON CLIMBING LADDERS, MECHANICAL MEANS SHOULD BE PROVIDED TO CONVEY THE MEN TO AND FROM THE SURFACE WHEN THE MINES ARE OF GREAT DEPTH.

III. *That accidents are of frequent occurrence in metalliferous mines; and that they principally result from miners falling from ladders and stemples, or from one level to another; from falls of the rock or stuff; from want of caution in blasting; from defective gear and imperfect supervision of machinery; from sudden irruptions of water or foul air, and from the bursting of boilers.*

To obviate as far as possible the various accidents to which miners are exposed, we recommend,—

1. THAT NO LADDERWAY SHOULD BE ALLOWED IN A DRAWING SHAFT WITHOUT THE SHAFT BEING PROPERLY DIVIDED OR BRATTICED OFF FROM THE FOOTWAY, AND THAT EFFICIENT SOLLARS SHOULD BE FIXED AT MODERATE DISTANCES IN ALL FOOTWAYS, WHETHER THE ASCENT OR DESCENT BE BY LADDERS OR STEMPLES.

2. THAT SHAFTS, WINZES, SUMPS, AND SHOOTS SHOULD BE MORE CAREFULLY GUARDED.
3. THAT MORE STRINGENT RULES SHOULD BE ENFORCED IN REGARD TO BLASTING, WITH A VIEW TO PREVENTING ACCIDENTS, AND THAT BRONZE TAMPING RODS AND PRICKERS SHOULD BE SUPPLIED TO THE MEN.
4. THAT THE PERSONS HAVING CHARGE OF THE FOOTWAYS AND OTHER WORKS UNDERGROUND SHOULD DAILY ENTER IN A BOOK A REPORT OF THEIR CONDITION TO THE AGENT OR CAPTAIN OF THE MINE, WHICH SHOULD BE PRODUCED IN CASE OF INQUIRY.
5. THAT THE BOILERS AND OTHER MACHINERY SHOULD BE PERIODICALLY EXAMINED BY THE MINE ENGINEER, AND THAT A MONTHLY REPORT THEREON SHOULD BE GIVEN IN TO THE CAPTAIN OR AGENT, TO BE PRODUCED BY HIM SHOULD OCCASION REQUIRE.
6. THAT THE MEN SHOULD NOT BE ALLOWED TO CHANGE IN THE BOILER HOUSE, WHICH NONE BUT THOSE IN CHARGE SHOULD BE PERMITTED TO ENTER.
7. THAT ALL BOILERS SHOULD BE PROVIDED WITH TWO SAFETY VALVES AND A WATER GUAGE OR A STEAM WHISTLE.
8. THAT PLANS AND WORKING SECTIONS OF ALL MINES ON THEIR BEING ABANDONED SHOULD BE DEPOSITED AT THE OFFICE OF THE CLERK OF THE PEACE FOR THE COUNTY, AND AT THE GOVERNMENT MINING RECORD OFFICE IN JERMYN STREET, FOR REFERENCE IN CASE OF WORKING BEING RESUMED, OR NEW MINES OPENED UP IN THE IMMEDIATE VICINITY.

IV. *That abandoned shafts, and old workings unprotected at the surface, are a cause of serious danger, not only to the miner, but to the public.*

The accidents consequent upon the practice of leaving abandoned shafts and workings insufficiently guarded or wholly unprotected, are so numerous that we think it very desirable,—

THAT AN EFFICIENT AND EASILY AVAILABLE LEGAL REMEDY SHOULD BE PROVIDED IN ORDER TO GUARD THE PUBLIC FROM THIS PROLIFIC SOURCE OF DANGER.

V. *That the employment of boys underground at an early age contributes to produce disease and premature death.*

We therefore think it desirable,—

THAT, AS A GENERAL RULE, NO BOYS UNDER THE AGE OF FOURTEEN YEARS SHOULD WORK BELOW THE SURFACE.

VI. *The system of mine clubs as at present in general operation is unsatisfactory, as not providing for cases of sickness as well as of accident.*

We therefore suggest,—

THE ADOPTION OF SUCH A SYSTEM OF MINE CLUBS AS WOULD AFFORD THE MEN SUFFICIENT MAINTENANCE DURING SICKNESS, AS WELL AS WHILE SUFFERING FROM THE EFFECTS OF ACCIDENT.

FABRY'S BLAST-FURNACE FOR LEAN COAL.

THE question of the employment of lean coal in blast-furnaces, and in the making of wrought iron, is, as is well-known, one of great importance to the Belgian coal-masters, and has consequently been the object of much attention for many years by the most eminent engineers in that country.

M. Auguste Fabry has recently patented a form of blast-furnace to effect this much desired object, drawings of which are given in Plate II. The main idea is to separate strictly the three stages of calcination, reduction, and fusion—each of which stages takes place in distinct compartments of the furnace, under conditions which the inventor believes will obviate the difficulties ordinarily met with when lean coal is employed. The calcination, which is effected by the waste heat in the space F, calls for no special remark. The reduction is

effected in a species of vertical retort D, heated on the exterior by the flame from the region of fusion C,—the ore being mixed with lean coal, which as a reducing agent is as efficient as coke, and presents no inconveniences when the flame only acts on the exterior and has not to traverse the mass. As to the fusion, that is effected under the reduction retort, in the part C of the furnace, into which the lean coal is introduced directly and set in immediate and energetic combustion by a blast of hot air.

The construction and divisions of the furnace are as follows: A is the crucible (or lower portion of the hearth)—B the twyers—C the space where the coal and the prepared ore are introduced to be fused (the boshes)—D space where the ore is prepared (the body)—E passages through which the flame passes from space C to the upper part of the space D—F space where the ore is roasted—G passages by which the flame passes from the upper part of the space D into the the space E—H tunnel-head by which the products of combustion pass into the atmosphere—I stack of furnace—K the fore-hearth—L doors by which the coal is introduced into the part C, to be consumed under the blast passing from the twyers—M openings by which the ore passes from the space D into the space C—N doors by which the ore, mixed with the flux and the quantity of coal necessary for reduction and cementation, is introduced—O opening by which the ore passes from the space F into the space D. The course of the flame is shown in the drawing by the single-headed arrows, and that of the materials to be fused by the double-headed arrows.

The ore, the limestone, and a certain quantity of coal are first ground up, and then thoroughly mixed together before being put into the furnace. The mixture thus prepared is introduced by the doors N into the space F, where it is brought to a red heat—in doing which it is necessary to spread it uniformly over the sole, and stir it from time to time. After being brought to this temperature it is passed into the body D by the opening O.

Arrived in the body D the mixture is again heated—first by the flame which comes from the upper part of the same body, and afterwards by that which passes in through the passages E. The mixture continues the descent through the body till it arrives at the space C by passing through the opening M, where it is fused by the action of the blast on the coal introduced into C by the doors L. The fused materials (slag and pig-metal) pass into the crucible and fore-hearth, whence they are tapped as in ordinary furnaces.

The distinguishing features of this furnace therefore are (1) that the fuel for heating to fusion is introduced directly into the space which corresponds to the boshes—(2) that the flame does not pass into the body—(3) that the matters to be fused are reduced to powder before being introduced into the furnace—and (4) that they undergo the operation of roasting in the furnace itself.

DUDLEY AND MIDLAND GEOLOGICAL SOCIETY.

The last number of the transactions of this Society shows an amount of activity and usefulness on its part which fairly entitles it to take a foremost place among our working provincial societies. Although its objects are rather discursive—ranging as they do from antiquarian enquiries to practical mining, and from biology to physics—as a rule, the papers published in the transactions seem to be sound and well written, barring a certain amount of fine and jocose writing which an

experienced editor would put his pen through. The geological papers are particularly good, especially those by the Rev. H. Housman on the Invertebrata of Paleozoic and Modern times, and by the Rev. W. Symonds on the Progress of Geological Science during the past year. From the latter paper we make the following extract explanatory of the more modern views on the origin of crystalline rocks. Considering the amount of misapprehension that still exists on this subject among young geologists, we congratulate the Dudley and Midland Society on having the matter placed so correctly and clearly before them as has been done by Mr. Symonds.

"You are aware that, until within the last few years, most geologists were of opinion that in Granite, Syenite, and other rocks of similar mineralogical structure, we beheld crystallised portions of this planet which had once been in a state of fusion, especially as Granite was often known to underlie and to be associated with certain very ancient metamorphosed deposits. It was generally maintained, in fact, that Granites and Syenites were in a molten state when the primitive world circled round the sun, a glowing molten mass. It is now known that Granite may belong to any geological period. In Germany Granite has been found with chalk fossils imbedded in it: and in the *Geological Journal* of last year, Mr. Sawkins records the association of Granite with Tertiary strata in Jamaica. There are *Stratified Granites* in North America which appear to be sedimentary deposits altered *in situ*. Again, Granite contains minerals which retain water in their composition; and Mr. Sorby has detected in Granite the existence of steam bubble cavities. Mr. Sterry Hunt goes so far as to say that he believes Granite veins to have been formed like Metalliferous veins, by aqueous deposition in fissures. Now, without going to this length, I think we may assume that *water* or *steam* must have been concerned in the formation of these rocks, and that therefore the original doctrine of cooling down by *dry heat* from a state of fusion will no longer hold good. The theory of the purely igneous origin of Granite breaks down under the light of modern chemical investigation."

The most prominent feature of these transactions, however, and the one which will be of most interest to our readers, is the excellent papers it contains on mining subjects. Mr. H. Beckett's paper, "On the Recent Discovery of Cannel Coal in North Wales," is highly creditable to the author, and puts on record a vast amount of valuable information—particularly as to the correlation between the coal seams of Flintshire and Denbighshire, for it seems to be now satisfactorily determined that the Main Coal of the two counties is identical, and that the Leeswood Cannel seam is the equivalent of the Lower Yard Coal of Ruabon. It is a curious fact that the latter coal has very recently been met with south of Ruabon as a true Cannel, instead of the ordinary house coal it produces northward. A paper of Mr. John Jones (the Secretary) has also some sensible remarks on mining education, particularly as affecting the South Staffordshire district. But the most notable paper in this number is probably that of Mr. Rupert Kettle, on the yield of the Ten Yard Coal. Our readers are already familiar with the rather sharp criticisms of Mr. Kettle on South Staffordshire mining, and the natural irritation which such criticisms—coming from an amateur—have caused among the mine-agents of the district. This paper received a reply, which is also published in these transactions, from Mr. H. Johnson, taking exception to most of Mr. Kettle's facts. As may be remembered, the controversy turned to a great extent on the merits and demerits of the long-wall and pillar-and-stall methods of working—Mr. Kettle being strongly in favour of the former while Mr. Johnson holds for the latter. In the discussion which resulted the usual differences of opinion appeared between the coal-masters and mine-agents as to which of these systems is best suited to the conditions of Staffordshire mining.

PRUSSIAN MINERAL STATISTICS FOR 1862.

The *Zeitschrift für das Berg- Hütten- und Salinenwesen im Preussischen Staate* gives the statistics of the position of mineral, metallurgical, and chemical manufacturing industry in Prussia for the year 1862, from which we abstract the following, giving the weights and value in English denominations, taking the *centner* at a cwt. and the *thaler* at 3*s*. This shows, for the raw mineral products, a total of 5,250,000*l*. and, for the metallurgical and chemical products, a total of 11,200,000*l*.

Mines and Quarries.

Number of Works.	—	Tons.	Value.	Workmen.	Women and Children.
484	Coal	13,088,390	£3,384,757	69,468	127,317
443	Lignite	3,807,049	499,860	11,534	25,451
1,125	Iron Ores	1,213,861	320,763	15,110	28,784
102	Zinc Ores	326,106	263,850	8,939	13,077
180	Copper Ores	112,275	115,889	5,219	9,033
205	Lead Ores	46,030	342,575	9,752	13,271
27	Sulphur Pyrites	22,312	9,682	291	452
4	Alum Ores	16,879	1,854	117	236
9	Fluorspar	4,391	1,804	43	106
15	Manganese Ores	1,778	4,420	128	203
8	Arsenic Ores	332	1,051	67	114
2	Graphite	284	329	18	8
2	Antimony Ores	78	855	41	80
5	Nickeliferous Ores	14	217	—	—
4	Cobalt Ores	3	15	—	—
1	Silver Ore	½	387	—	—
268	Slate	—	24,478	1,489	3,765
21	Salt	176,247	259,033	1,884	4,639

Smelting and Chemical Works.

490	Pig-Iron	624,740	3,263,839	22,740	50,912
481	Wrought-Iron	408,066	4,584,448	25,626	57,878
195	Steel	39,728	897,971	6,075	10,805
62	Zinc	74,984	1,257,472	6,351	10,343
1	Gold	—	20	—	—
12	Silver	—	205,678	858	1,830
28	Lead	23,146	420,371	823	1,739
39	Copper	2,582	240,342	599	1,352
61	Brass	1,975	194,651	848	2,184
6	Nickel	275	69,150	475	849
8	Arsenic	223	2,931	52	100
1	Antimony	60	3,750	4	11
15	Vitriol	2,071	8,468	245	706
9	Alum	3,040	31,528	278	758
2	Sulphur	373	3,422	20	60
1	Cadmium	—	50	—	—

FAIRBAIRN ON THE APPLICATION OF IRON TO BUILDING.

On the Application of Cast and Wrought Iron to Building Purposes. By William Fairbairn, C.E., F.R.S., F.G.S. Third Edition. London, Longmans.

The value of this work, in many respects the most important result of Mr. Fairbairn's labours, is too well established to make it necessary to do more than give a passing reference to the appearance of a new edition in a form uniform with the other works of the Author. To those, however, who may not be acquainted with its exact nature, we may just mention that, besides its special object—the application of iron to building purposes—it is, to a great extent, a general treatise on the strength of wrought and cast iron, illustrated by copious practical examples; and consequently more acceptable to practical men than many formal works on that increasingly important branch of engineering—a branch, besides, so intimately associated with the engineering departments of Mining, Quarrying, and Metallurgy, as to be necessarily one of special interest to our readers.

There can be, indeed, no question that this work is almost essential, as a book of reference, to most persons engaged, or likely to be engaged, in the engineering branches of any of these pursuits, in which iron is so largely used for such various purposes. In our own experience, we could mention many cases where heavy loss and grievous disappointment would have been spared if such a guide had been at hand. In remote countries especially, where mining engineers are frequently thrown on their own resources, a work of this kind could not fail to be an invaluable aid.

It may be noted that in this edition Mr. Fairbairn has rather amplified those portions of his work relating to wrought iron as compared with cast iron, in view of the rapidly increasing adoption of the former for almost all purposes.

SOUTH WALES INSTITUTE OF ENGINEERS.

The annual general meeting of members of this Institute was held at Swansea on October 22nd, Mr. A. Bassett, President, in the chair. The following officers were elected for the ensuing year; President—Mr. T. Menelaus of Dowlais; Vice-Presidents—Messrs. F. Levick, R. Beddlington, G. C. Greenwell, and Richards; Council—Messrs. H. Huxham, Hosgood, Parry, T. F. Brown, G. Brown, Christopher James, and J. E. Wales. The President, in his address, stated that when the whole of the subscriptions for 1863-4 were paid up there would be a balance in hand of about 400*l*.

The papers read were:—"On Utilising Pit Tips," by Mr. W. B. Monks; "On the Manufacture of Patent Stone Bricks," by Captain J. J. Bodmer; "On the Port of Cardiff and the Aberdare Coal-Field," by Mr. A. Bassett; and "On the Utilisation of Slag from Blast-Furnaces," by Mr. G. Parry. We shall give an abstract of these papers on a future occasion.

Extracts, Notes, and Memoranda.

MINING AND QUARRYING.

APPLICATION OF FIRE TO BREAKING GROUND.—Before the application of gunpowder to blasting it is well known that, from the most ancient times, fire was largely employed on the Continent in aiding the breaking of ground in mining. It has, however, for some time been considered as a thing of the past; the last locality where it was employed being the ancient, and almost classical, Rammelsberg mine, in the Harz, where the peculiarly tough nature of the rock gave it unusual advantages. This mode of working (which indeed appears never to have been completely abandoned in Saxony) has, however, been recently resumed, with improvements in detail, at the St. Christophe pyrites mine, near Breitenbrunn, under the direction of Herr Fickentscher. It had already been attempted, a few years ago, by Herr Clöter, but was abandoned in consequence of the great expense of the wood fuel then used. The fuel now adopted is Zwickau coke, which is used as follows. Two iron bars, of different diameters, are placed across the level—the smaller one in advance, so that when the grate (made of bars 20″ long) is placed on them, it inclines towards the face of ground to be broken. At a distance of 8″ or 10″ from this face, a wall of refractory brick is built on the grate up to the top of the level. The bottom part of this wall has openings for the purpose of lighting the fire, and towards the top it is provided with air holes. With a closed fire-place, thus constructed, about 1 scheffel (1½ bushel) of coke, costing 2 sgr. (2½*d.*), burns from 4 P.M. till 5 A.M., when the wall is removed, and the whole left to cool, after being sprinkled with water. About noon the face of the rock spontaneously detaches itself, and after that a further portion is broken. The effect of the fire generally extends to the depth of 8″; and with 1 scheffel of coke, from 16 to 24 cwt. of ore is obtained, at 100% less cost than it could be broken with powder.

APPLYING DOUBLE SETS OF PICKS IN GETTING COAL.—Mr. G. E. Donisthorpe has made an improvement in his machinery for working coal, by arranging the apparatus so that, when the picks are actuated by engines worked with compressed air, two sets of picks may be caused by the engine to act alternately. To effect this, the engine is mounted on a suitable truck with the picks; the piston rod of the engine gives motion to a lever turning on a centre intermediate of its length, and to the ends of which the two sets of picks are respectively attached, so that as one set acts the other set retires, consequently the movement of the pick in either direction actuates one set of picks while the other set retires.

MACHINERY FOR CRUSHING QUARTZ AND EXTRACTING GOLD AND SILVER.—Among machines for this purpose recently patented are some by Dr. Hall, of New York, one of which consists of a combination of revolving edge-runners or chasers, arastras, and amalgamators, in the same annular trough; so that quartz, fed into the trough in lumps of any size, is first crushed, then finely pulverised, and afterward has the metal extracted, all at one operation. The quartz is reduced to an impalpable pulp; and the extraction of the lighter particles of metal is effected by amalgamated copper plates attached to the chasers and

arastras, while the heavier particles are collected at the bottom of the trough; the foreign matter being all carried away by a flow of water from the trough through siphons. These siphons (which are the subject of a separate patent) have each a mercury-chamber, in which any gold or silver that escapes from the trough with the wash-water is amalgamated and retained.

Gold Mining at Eule in Bohemia.—In this locality, which is situated about twelve miles to the south of Prague, the gold mining operations, which had been abandoned for a considerable length of time in consequence of the great difficulties of working, are now being resumed after the completion of the adit level. Besides their local importance, these workings also present points of general interest. The gold is found in lodes, and small branches, varying from a quarter of an inch to several feet in width, which occur in a crystalline clay-slate bordering the granite. The vein mass is arranged in a banded form, and is principally composed of quartz; less frequently of calc-spar; and still less frequently of chlorite. The veins are also sometimes filled up with clay intermixed with fragments of the neighbouring rock. The only ores occurring are iron-pyrites with its products of decomposition, and native gold. This latter is found finely disseminated through the large compact masses of quartz, in grains in the smaller quartz branches, and in a laminated or crystalline form in the decomposed quartz; accompanied, in each case, by the products of the decomposed iron-pyrites. There is an intimate connection between the occurrence of the iron-pyrites and that of the gold; and the former is not only contained in the lode, but also in the country. The gold is mostly found in the branches at their points of contact with branches of quartz.

METALLURGY AND CHEMICAL MANUFACTURES.

Treatment of Zinc Ores at Przibram.—An attempt at treating Zinc Ores by the wet method has been made at Przibram, in Bohemia. The large quantity of blende that is found in the ores of this district occasions, as is well known, a notable loss of lead and silver. It has therefore been endeavoured to separate as much as possible, the argentiferous blende. This is first roasted, then treated by dilute sulphuric acid; after which the plumbiferous and argentiferous residues are fused, the lye treated for the purpose of separating the sulphuric acid, and then the zinc extracted from the products of this new operation—of which the residue (containing a considerable proportion of iron) can be utilised in the fusion of the lead ores. The attempt to bring the process into practical use has not been so successful as it had been expected it would have been, judging from experiments made on a small scale. The time required for the lixiviation is too long, and the liquor too poor.

Extracting Gold by Chlorine.—The *Scientific American* describes a process for extracting gold founded upon the convertibility of gold into a chloride by the action of chloride gas, and the solubility of this chloride in water. The pulverised and washed ore, which contains the gold in its metallic state, is put moist into vessels with perforated false bottoms, under which chlorine gas, carefully freed by washing from any admixture of hydrochloric acid, is introduced. Percolating upwards through the ore, the gas converts the gold into chloride of gold. As soon as the free chlorine begins to escape above, the supply

of gold is stopped, and the soluble chloride of gold extracted by leaching the ore with warm water. The solution is then collected in suitable vessels, and the gold (after the free chlorine yet remaining has been expelled by heat) is precipitated, either in the form of a sulphide by means of sulphuretted hydrogen, or in the metallic state (as a brown powder) by the addition of sulphate of the peroxide of iron. Instead of chlorine gas, water previously saturated therewith, or an acidulated solution of chloride of lime, may be employed. It is stated that this process admits of a complete extraction of the gold, if the character of the ore favours its application.

A NEW BELL METAL.—M. Micolon proposes for such articles as bells, hammers, anvils, and other non-cutting instruments, a mixture of iron, manganese and borax, in the proportions of twenty parts of iron turnings, eighty parts of steel, four parts of manganese, and four parts of borax. If it is desired to increase the tenacity of the metal, two or three parts of wolfram may be added. The iron and steel are placed first in a crucible, then the manganese and borax, and the crucible is then filled with charcoal. The mixture must be poured rapidly into the moulds.

DIRECT DECARBURISATION OF CAST-IRON IN THE BLAST-FURNACE.—M. Muller proposes to effect the direct decarburisation of the cast-iron in the blast-furnace itself, by making the oxides of iron react upon the fluid particles of cast-iron, at the moment when they trickle separately through the slag to the bottom of the hearth of the furnace. For this purpose the furnace has three stages of twyers directly over each other in the hearth, which is constructed as high as the point occupied by the two supplementary twyers. This deep and narrow hearth is protected by water-blocks and twyers to prevent the brickwork from being attacked, and to maintain these restricted dimensions so as to obtain a very high temperature and an energetic mixing of the oxides of iron, the cast-iron, and the slag. The pressure of the blast is also considerable—20 centimetres (8"), or more, of mercury. Hot blast is supplied to the top and bottom twyers; the middle one blowing with hot air and rich pulverised oxide of iron—sifted, and heated to a dull red heat, and then introduced into the blast-pipe by distributing apparatus, in such a manner as to keep up a continuous supply. The number of turns per minute made by the tap of the distributor regulates the proportion of oxide of iron injected, and, consequently, the more or less complete decarburisation of the cast-iron.

REDUCTION OF CHLORIDES AND FLUORIDES BY ZINC VAPOURS.—Monsieur Poumarède effects this reduction by a process conducted in an apparatus composed in the following manner. 1st, there is a cylindrical crucible, of soft iron or refractory clay, from 15" to 16" high from 8¼" to 9½" in diameter, in which, from 1½" to 2" from the upper edges, a lateral tube is inserted to which an addition can readily be made. 2nd, there is a second crucible, of porcelain or sheet-iron, from 6" to 8" high by from 6" to 7" in diameter, which fits easily into the first in which it is placed on a small tripod. 3rd, there is a frame, or small round lattice of iron sheet or wire, of such a diameter as will allow of its being readily placed in the smaller crucible, 2" or 3" above the edges of which it is firmly fixed, on an iron tripod. With the apparatus thus arranged, the zinc that is to bring about the reduction is placed in the bottom of the 1st crucible, in which is then placed (on its tripod) the interior crucible in which is placed the metallic chloride to be reduced, in which is lastly inserted the frame on which some powdered charcoal is placed. The apparatus is now placed in a wind-furnace,

in such a manner that the fire shall not reach the upper part, and subjected to a steady red heat for about an hour; after which the reduction is complete, and the reduced metal withdrawn from the crucible as soon as it is cool.

DECOMPOSING PEAT BY POTASH.—Mr. C. Fleury, of Brussels, treats the peat with carbonated calcined potash, by which the mineral substances and woody fibre are decomposed and dislodged. Both the decomposed and undecomposed parts are converted into heavy fuel, the pulp being compressed and dried in the ordinary manner.

IMPROVED METHOD OF COOLING IN THE MANUFACTURE OF ARTICLES OF CAST-IRON.—Mr. N. McHaffie, of Glasgow, in manufacturing cast-iron articles, in which great toughness is required together with considerable hardness, mixes white pig with mottled or grey pig, which, if cast in the ordinary manner, would be too hard to be conveniently cut and worked. The metal is run into a mould of fireclay, or other material, which is kept heated in a furnace to a red heat or hotter, and is then gradually cooled down in the furnace. This gradual cooling of the metal ensures uniformity of structure throughout the mass, and, although the metal is still hard, the article can be afterwards turned or shaped, if necessary, it can also be hardened and tempered in the same way as steel.

MECHANICS AND ENGINEERING.

STEAM PUMPS.—The object of this invention is to create a vacuum in a vessel by means of a current or blast of steam, so that water may be drawn up the supply-pipe to fill this vacuum, and be discharged from the vessel through a suitable opening or nozzle. For this purpose the body of the pump consists of a spherical vessel provided with a suction-pipe, by which the water to be raised is conveyed into the vessel, which is also provided with a discharge-pipe like ordinary pumps. Another pipe, which may be called the steam-pipe, is also adapted to the body of the pump, through which it projects, and terminates opposite to the discharge-pipe. Steam under pressure is admitted through the steam-pipe, and as it fills the vessel and rushes out of the discharge-pipe, it creates a partial vacuum in the vessel, and therefore causes the water to rise up the suction-pipe and enter the body of the pump.

RAISING PETROLEUM IN SPRINGS.—At a recent meeting of the Polytechnic Association of the American Institute, Dr. Rowell exhibited a model illustrating an apparatus recently introduced in the oil region for raising petroleum. By the present mode, after a hole some 4 or 5 in. in diameter is bored through the earth down to the oil, a pipe is introduced with a pump near the bottom, and the oil is thus pumped out. In some cases the pressure of gas upon the surface of the liquid forces the oil nearly up to the surface, and it is in these cases that the new apparatus is employed. A second pipe is introduced into the hole, with its lower end bent upwards, so as to enter the lower end of the first pipe. Air is then forced by an air-pump down through the second pipe into the lower end of the first pipe, and as the bubbles rise along this pipe they so reduce the weight of the liquid column that the pressure of the gas raises it to the surface, and thus a constant flow is secured. Dr. Rowell's apparatus consists of two glass tubes immersed part of their length in water, with the lower end of one tube bent up and entering the lower end of the other. On blowing into the

bent tube, the weight of the aqueous column in the other tube is so reduced by the bubbles of air, that the pressure of the water outside of the tube forces the water within the tube to the top, and it overflows.

COMPARATIVE DUTY OF PUMPING ENGINES.—Monsieur Soulary has given, in a recent number of the *Bulletin de la Société de l'Industrie Minerale* of St. Etienne, a notice of certain experiments on the comparative duty of the different types of pumping engines in use in the coal basin of the Loire, which, although it presents no features of novelty to our engineers, is worth referring to as showing the direction of opinion on the Continent. Four engines were experimented on, all single-acting and medium pressure:—(1) The Egarande beam engine, Cornish pattern, condensing but without expansion; (2) the St. Antoine engine, direct-acting without expansion or condensation; (3) the Sainte Colette engine, direct-acting and condensing, but without expansion; and (4) Davey's engine, Cornish pattern, with expansion and condensing. The results of the experiments showed:—that the 1st engine (Egarande), although the oldest, and allowing a waste of steam, gave a better duty than the 3rd engine (Sainte Colette); that this latter gave a better duty than the 2nd (St. Antoine), in consequence of its being a condensing engine; and that the 4th (Davey's), with a considerable expansion ($2\frac{3}{4}$), gave more than double the duty of the 1st engine (Egarande), which is built on the same pattern, but with little or no expansion. On the whole, M. Soulary concludes that there is an economy in pushing the expansion as far as possible, although, of course, this requires a proportionate increase in the mass of the rods, balance-bobs, and all connections, the extra and original cost of which, however, he thinks is soon covered by the continuous saving in fuel. We may add that in making these trials the state of the pitwork, and other essential but variable elements were taken into consideration, without which comparisons of duty are worthless and even delusive—as, for instance, those statements of duty given of the few engines still noticed in the Cornish Engine Reporters.

MISCELLANEA.

GREAT DEPOSIT OF LEAD SLAG IN GREECE.—At the meeting of the Imperial Geological Institute of Vienna, on August 16, Baron von Hingenau stated that at the lead mines of Laurion, in Attica, worked for many centuries but now abandoned, there is an accumulation of slag, estimated at 4,000,000,000 pounds in weight (about 2,000,000 tons), which, according to assays made at Marseilles, produces, on an average, from 6 to 10 kilogrammes of lead and 3 grammes of silver per 100 kilogrammes (equals from 6 to 10% of lead containing from 6 to $9\frac{1}{2}$ ounces of silver per ton). A French company has undertaken the working of this slag, paying 50,000 drachmas (about 1,800*l.*) to the Greek government, and an annual rent of 2,000 drachmas (about 75*l.*) to the owners of the ground. Buildings, furnaces, engines, &c., have been already erected for metallurgical operations at a cost of 500,000 francs (20,000*l.*). [Communicated by Count M.]

SCHOOL OF MINES, COLUMBIA COLLEGE, N. Y.—A school of mines has been established in connection with Columbia College, New York, the first session of which will open on November 15th.

GUN COTTON.—The members of the Government Committee on Gun Cotton visited the Allenheads Lead Mines (part of the famous W. B. Lead Mines, the property of W. B. Beaumont, Esq., M.P.) during the middle of the past month, where they witnessed an extensive series

of experiments, both underground and at the surface, with a view to compare the effects of gunpowder and gun cotton. The experiments were arranged under the direction of Mr. Thomas Sopwith, F.R.S., the manager-in-chief of these mines, who is himself a Member of the Committee.

In our last number, page 220, we referred to the discovery of Herr Nobel of the increased effectiveness of blasting powder by the addition of nitro-glycerine, we regret to announce that the works which he had recently erected near Stockholm, for the manufacture of this article, were totally destroyed by an explosion, on September 24th. Several persons were killed, among them the son of Herr Nobel, and many seriously injured.

We regret to announce the death of Mr. James Lanyon, for upwards of twenty years the toller of the Basset property, and more recently the purser of South Frances, which took place at Camborne on October 3rd.

At the meeting of the Staffordshire Ironmasters at Wolverhampton, on the 12th, it was announced that Mr. Phillip Williams, the chairman of the Association, had died that day, at his residence at Wednesbury Oak. Mr. Williams had been, as head of the firm of Phillip Williams & Sons, all his life largely engaged in the iron and coal trade of South Staffordshire.

We have to announce the death of Mr. Henry Bath, head of the well-known firm of Henry Bath and Sons, of Swansea, which took place at Falmouth, on Oct. 14.

Bibliography.

CARRIÉ, L'ABBÉ.—Hydroscopographie et métalloscopographie, ou l'art de découvrir les eaux souterraines et les gisements métallifères au moyen de l'électro-magnétisme. (Hydroscopography and Metalloscopography, or the art of discovering subterranean waters and metalliferous deposits by means of electro-magnetism.) Paris: Mallet-Bachelier.

DEHMS.—Colorimetrische Analyse. (Colorimetrical Analyses.)—Dingl. J., Bd. 172.

A mode of ascertaining the strength of solutions of ammoniacal copper by comparison with standard blue glasses. It is also applicable to cobalt.

FALLER.—Kurze Uebersicht des Silber- und Bleibergbaues bei Przibram in seinem jetzigen Zustande. (A Short Review of the Present Condition of Silver and Lead Mining at Przibram.)—B. u. H. Jahrb. der K. K. Bergakademien zu Leoben, XIII. Band.)

Mining operations have made such great progress of late years at Przibram as to render this paper worthy of the attention of all miners.

GRATEAU, ED.—Revue Semestrielle des Travaux d'Exploitation des Mines, et de Metallurgie. (Half-yearly Review of Works of Mining and Metallurgy.)—Revue Univ., 4th livr., 1864.

An admirable summary of the technical and scientific progress of Mining and Metallurgical literature and invention.

GRIMM.—Ueber die geognostischen Verhältnisse und die Erzlagerstätten der Gutglückzeche zu Oberlischnitz in Böhmen. (The geognostical relations and the ore-deposits of Gutglücks mine at Oberlischnitz in Bohemia)—B. u. H. Jahrb. der K. K. Bergakademien zu Leoben, XIII. Band.

HABETS, A.—Des Fahrkunst à une Tige à propos de la Fahrkunst à Traction Direct d'Angleur. (The Single-rod man-engine *à propos* to the direct acting man-engine of Angleur.)—Revue Univ. 4th liv., 1864.

Abstract to be given in next number.

IUCHO.—Ueber die Erweiterung des Grubenbetriebes und die neue Werksanlage bei K. K. Saline Thorda in Siebenbürgen. (Upon the Extension of the Mining operations and the new works at the Imperial salt works at Thorda, Transylvania.)—B. u. H. Jahrb. der K. K. Bergakademien zu Leoben, XIII. Band.

KUBORN Dr. H.—Etude sur les maladies particulières aux ouvriers mineurs employés aux exploitations houillères en Belgique. (Study on the special diseases of miners working in the Belgian collieries.)—Paris.

MILLER, A.—Die nutzbaren Mineralien von Obersteiermark nach geognostischen Zohnen betrachtet. (The useful Minerals of Upper Styria considered in geognostical zones.)—B. u. H. Jahrb. der Bergakademien zu Leoben, XIII. Band.

MRÁZEK, W.—Ueber Kupfer- und Nickelvorkommen in der Producten der Przibramer Schmelzhütte. (Upon the occurrence of copper and nickel in the products of the smelting works at Przibram.)—B. u. H. Jahrb. der K. K. Bergakademien zu Leoben, XIII. Band.

—— Ein Beitrag zur Theorie der Przibramer ordinären Bleiarbeit. (Contributions to the Theory of the ordinary lead-smelting process at Przibram.)—*Ibid.*

NAUMANN, Dr. C. F.—Geognostische Beschreibung des Kohlenbassins von Flöha, im Königreich Sachsen. (Geognostic description of the Flöha Coal-basin, Saxony.) Leipzig: W. Engelmann, 1864.

The result of the first of a series of surveys undertaken by Prof. Naumann, the celebrated geologist, to illustrate the coal-fields and mineral deposits of Saxony. It consists essentially of a map accompanied by an explanatory text.

O'HARA, H., C.E.—The Supply of Fuel in Ireland: an Inquiry into the Character and Extent of the Irish Coal Fields, Peat Marshes, &c.—Dublin Quart. Jour. of Science, No. XVI.

A valuable and interesting paper, treating particularly on the economical position of the Irish collieries and turbaries. Illustrated by two maps and 13 Sections.

RIVIÈRE.—Mines et usines des rives du Rhone. (On the Mines and Smelting works on the banks of the Rhone.)—Paris: Dubuisson.

SCHUBERT.—Ueber das Vorkommen des Ozokerits—Bergwachses—und der ihm verwandten Mineralien und deren Gewinnung in Galizien. (Upon the occurrence of Ozokerite—mountain wax—and the minerals associated with it and upon the method of obtaining it in Galicia.)—B. u. H. Jahrb. der K. K. Bergakademien zu Leoben, XIII. Band.

SCHWIND, VON.—Betrachtungen über die Bedingungen unter welchen die Benutzung der Salzlager mittelst Werkswässering vortheilhaft ist. (Considerations of the conditions under which deposits of Salt can be profitably utilised by means of water.)—B. u. H. Jahrb. der K. K. Bergakademien zu Leoben, XIII. Band.

WENKENBACH, F.—Bergmännisches Wörterbuch. (Mining Glossary.)—Wiesbaden, C. Limbarth, 1864.

BERICHT über die dritte allgemeine Versammlung von Berg- und Hüttenmännern zu Mährish-Ostrau. (Report of the third general meeting of Miners and Smelters at Ostrau in Moravia.)—Vienna, 1864.

This report contains several interesting papers read at the meeting, among which may be mentioned—One by Herr Benigny on the ascertaining the caloric effects of the various kinds of coal in puddling furnaces; one by Herr Obtulowicz, on the Carpathian spharosiderite; one by Herr L. Hohenegger, on the production of Spiegeleisen at Hradek in Upper Hungary; and one by Herr Rittinger on the various sizes of sieves used for separating ores.

BISCHOF'S Eisenpulver zum Fällen von Kupfer. (Bischof's Iron-powder for precipitating copper.)—Dingl. J., Bd. 172.

Roasted residues of Spanish or Irish ores which contain a small percentage of copper are heated with coal in the reverberatory furnace, and by means of the powder thus formed copper is precipitated from solutions.

KARTE über die Production, Consumtion, und Circulation der mineralischen Brennstoffe in Preussen während des Jahres 1862. (Chart of the Production, Consumption, and Distribution of Combustible Minerals in Prussia, during the year 1862.)—Berlin.

Patents relating to Mining and Metallurgy.

(Compiled from Commissioners of Patents' Journal.—Subject matter only given.)

UNITED KINGDOM.

APPLICATION FOR PATENTS FROM SEPT. 23RD TO OCT. 20TH.

2,342 (1864). A. H. BRANDON (com. from W. P. DOWNER), Refining petroleum

2,360 (1864). J. A. HARRISON, Applying the slag from blast and other furnaces to useful purposes.

2,396 (1864). G. HASELTINE (com. from the BOSTON MILLING AND MANUFACTURING COMPANY), Machinery for breaking and grinding ores.

2,407 (1864). A. A. CROLL, Treatment of sulphate of alumina.

2,413 (1864). J. JOHNSON, Decomposing common salt with sulphuric acid in the manufacture of soda and muriatic acid.

2,436 (1864). H. J. STANDLY and W. PROSSER, Welding iron and other metals.

2,460 (1864). B. MARGULIES and J. K. LEATHER, Manufacture of salts of chromium.

2,468 (1864). T. PARKINS, Manufacture of prussiates of potash.

2,472 (1864). G. HASELTINE (com. from B. PENNIMAN), Purifying coal and ores.

2,484 (1864). J. G. BECKTON, Heating ovens for distilling shale and coal.

2,487 (1864). J. CASSELL, Treating coal, peat, and shale.

2,497 (1864). J. I. VAUGHAN, Refining coal, petroleum, and hydro-carbons.

PATENTS SEALED FROM OCT. 7TH TO OCT. 21ST.

895 (1864). J. NISBET, Apparatus for getting or cutting minerals.

1,500 (1864). J. G. JONES, Machinery for getting coal and other minerals.

1,686 (1864). J. H. JOHNSON (com. from A. H. EVERETT), Smelting lead ores, and refining and softening lead.

PATENTS ON WHICH DUTY HAS BEEN PAID, FROM SEPT. 20TH TO OCT. 14TH.

2,377 (1861). J. JACOB (com. from C. PREISENHAMMER and C. WENIGER), Application of hydrogen gas to the manufacture of iron and steel. [50*l.*]

2,517 (1857). W. HENDERSON, Treating certain ores and alloys. [100*l.*]

2,533 (1861). L. CHRISTOPH, W. HAWKSWORTH, and G. P. HARDING, Manufacture of cast-steel and other metal tubes. [50*l.*]

2,609 (1861). R. MUSHET, Manufacture of titanic pig-metal or alloy of titanium and iron. [50*l.*]

PATENTS VOID BY NON-PAYMENT OF DUTY FROM SEPT. 24TH TO OCT. 17TH.

2,412 (1861). W. CLARK (com. from A. M. M. COMTE DE LARA), Manufacture of Peat.

2,512 (1861). I. EVANS, jun., An improved miner's lamp.

COLONY OF VICTORIA (AUSTRALIA).

PATENTS FROM FEB. 18TH TO JUNE 3RD.

523 (706). A. C. L. DE LACY, Treating aurifereous, argentiferous, and mineral rocks.

525 (708). J. W. and A. EVANS, Separation of metals capable of amalgamation.

530 (713). J. C. LYONS and A. HIBBERSON, Manufacture of hydro-carbonic fuel.

AUSTRIA.

PATENTS DELIVERED, PROLONGED, AND BECOME VOID, JUNE AND JULY.

287. A. IWAN, A circular machine for cutting coal. [Delivered.]

322. E. A. PAGET, Manufacture of wrought-iron and steel. [Delivered.]

236. E. W. SIEMENS and J. G. HALSKE, A peculiar regenerating gas and coke furnace. [Prolonged.]

258. A. V. WINTERSBERG, Manufacture of shear steel by overheating in reverberatory furnaces. [Prolonged.]

223. C. Pauvert, Converting all kinds of iron into "German steel." [Become void.]

229. Austrian Chemical and Metallurgical Society, Treatment of sulphuretted and oxidated copper ores and grey copper by a wet process. [Become void.]

234. J. Jacob, Applying tungstic ore to the manufacture of iron and steel. [Become void.]

BELGIUM.

Patents Delivered from Oct. 1st to Oct. 15th.

16,749. E. A. Lesieur, Manufacturing phosphates.
16,758. P. Rosé and Vanhaegenborgh, Converting iron into steel.
16,776. J. Clayton, Reverberatory furnaces.
16,800. C. E. Crawley, Improvements in miners' lamps.
16,808. F. Avery, Improvements in Blake's crushing machine.
16,810. E. A. Cotelle, Distilling sulphuric and other acids.
16,822. V. Limbor, Defawes' zinc furnaces.
16,823. F. Magnan and F. Debaisieux, Fastening miners' lamps.
16,853. R. Weinmann, Sifting minerals.

FRANCE.

Current List of Patents.

62,731. Garton and Hill, Apparatus for smelting.
62,774. Pitay, Preserving metals from oxidation.
62,824. Delsaux, Treating mineral oils.
62,832. Helson, A universal system of reducing, cementing, and rapidly smelting iron and other ores, as well as scoria, dross, and scales.
62,846. T. du Motay and Karcher, Manufacturing fluoride of silicium.
62,887. Chercot, Petrifying or treating peat.
62,904. Smith, Improvements in blast-engines.

THE NETHERLANDS.

Patent delivered since Aug. 3rd.

5. G. W. Smits and A. J. J. de Wolff, Treatment of the residue of soda and analogous substances for the manufacture of sulphur and sulphuric acid.

UNITED STATES.

Patents Issued from Sept. 13th to Sept. 27th.

44,257. A. W. Hall, Quartz crushers.
44,258. S. Lewis, Deodorising petroleum, etc.
44,310. W. Hazen, Improved process for tempering steel.
44,320. M. Laflin, Separating gold and silver from ores.
44,343. H. H. Scoville and P. W. Gates, Amalgamating gold and silver.
44,422. H. L. Hopkins, Improved amalgamator.
44,450. A. F. W. Partz, Ore crushers.
44,481. W. Archer, Refining hydrocarbon oils.

SPECIFICATIONS PUBLISHED, AND PRICES.

From Oct. 1st to Oct. 19th.

*** Specifications will be forwarded by post on receipt of price and postage at Her Majesty's Patent Office, 25, Southampton Buildings, London, W.C.—The amount of postage may be estimated from the price, as follows:—Where the price does not exceed 1*s.* 6*d.*, postage will be 1*d.*; above 1*s.* 6*d.*, and not exceeding 3*s.* 4*d.*, it will be 2*d.*; above 3*s.* 4*d.*, and not exceeding 6*s.* 4*d.*, it will be 4*d.*—Sums exceeding 5*s.* must be remitted by P. O. O., on Holborn Office, payable to *Bennet Woodcroft*.

158 (1864). G. E. Donisthorpe, Machinery for getting coal, stone, etc.; 10*d.*
192 (1864). F. North (com. from C. Fleury), Treating peat and turf; 1*s.* 4*d.*
218 (1864). G. Darlington, Manufacture of zinc white; 4*d.*

Current Review of Mining, Quarrying, and Metallurgy.

CORNWALL, DEVON, AND WEST SOMERSET.

Up to the time we write, Cornish mining shows no signs of rallying. The symptoms of improvement in the money market towards the close of the month will no doubt favourably affect certain market mines, in the floating of which the interests of the brokers are so deeply involved; but the unfavourable condition of the tin and copper markets—a condition not to be accounted for merely by pressure on the money market—must continue to affect adversely legitimate mining pursuits. During the month the tin standard has been again put down, 2*l.* on superior fine, and 1*l.* on other qualities; and the copper standard has fallen about 2*l.*

We extract the following article on "The Tin Mines of Cornwall" from the *West Briton*. The tone of this article is excellent, and we think fairly represents the opinion of the respectable portion of the Cornish mining interest. As the foremost advocates for the adoption of a new system of selling tin ores, we of course repudiate the notion that the present low prices are in any degree due to the existing system. But we are quite clear that a system of competition would secure a proportionately better price for the miner without any ultimate injury to the smelter. Indeed, the tin smelting business is, at present, admittedly by no means an out of the way lucrative one. Those who do extraordinarily well realise probably more by their mercantile than by their purely metallurgical operations. But is this to be wondered at when we consider that the metallurgy of tin has been absolutely stationary for generations, and must remain so as long as the present close system continues? Like all close monopolies, the old system of Cornish tin smelting, in a struggle to avert all change, will ultimately end in benumbing itself. Old established monopolies—whether in politics or in trade—who have the good sense to see that the time for successful resistance has passed, may take the lead in the inevitable new order of things, if they frankly accept it. Where, on the contrary, trusting to their acquired position, they doggedly declare themselves enemies to all change, the result is, sooner or later, a revolution by which they are swept away. Cornish tin mining, besides, differs from most other businesses. As a rule, the majority of shares in mines is held out of the county; so that however much the various Cornish practices of "give and take" may modify the present injurious system of selling tin as far as Cornishmen are concerned, there are no such pleasant compensations for outside shareholders. Outside shareholders in Cornish mines may not be very wise people as a rule—indeed it may be considered that the very fact of their occupying that position affords strong evidence to the contrary;—but still, when the real circumstances which influence the sale of tin are placed clearly before them—which no doubt will be done sooner or later—we doubt very much if any considerable supply of outside money will continue to flow into Cornish tin mines. Whether this point has received any serious consideration we do not know, but we think it is one well worth pondering on. Considering the prospects of copper mining, it will be a bad day for the industrial interests of the county when Cornish tin mining shall have got a thorough bad name, and be held in as low estimation as it is said to have been by the late Mr. Michael Williams. Even with low prices, Cornish tin mining has a great future before it, if the aban-

donment of the present Chinese polity can be brought about, and the still unbounded metalliferous resources of the county be opened out to the progressive advances of metallurgic skill and mercantile enterprise.

"The present difficulties of the tin mines, and the peculiar mode in which their ores are disposed of to the smelters, have been subjects of discussion in our columns for some time past. As might be expected, the writers of the letters that have appeared have shown some diversity of opinion; but it is remarkable that nearly all of them have concurred in denouncing the present system of selling black tin, as very objectionable on many grounds, and injurious to the interests of the mine shareholders. Instead of the present system of private selling, they advocate sales at public ticketings, as in the case of copper ores. They believe that by this mode of sale a fairer competition and better prices will be realised for their ores. Not only in newspaper correspondence, but at mine meetings where the subject has been brought forward, a strong feeling has been shown in favour of tin ticketings. At the last South Frances meeting, it was the unanimous opinion of those present that the system now pursued is most unsatisfactory both for the smelter and the miner; and it was suggested that at all meetings of mine adventurers, the subject of tin ticketings should be discussed.

"Now we are not about to argue that there would be no benefit derived from the sale of tin ores by ticket. The practical gentlemen who have discussed the subject in our columns, and who are so strongly in favour of that mode of sale, are better able to form an opinion than those who have not been so intimately connected with tin mines and their working operations. But we attribute the present difficulties of our tin mines, and the low price of tin, mainly, not to the want of tin ticketings—although they might do much good—but to the supplies from our tin mines having exceeded—and considerably exceeded—the demand for tin. Let us see how far statistics will bear out this position. The Board of Trade abstract has recently been published, and gives the quantities of metals produced from British ores for nine years ending 1862, to which if we add Mr. Hunt's returns for 1863, we have the ten years complete; and the following are the figures;—

Years.	White Tin Tons.	Value.	Years.	White Tin Tons.	Value.
1854	5,974	£690,000	1859	7,110	£929,390
1855	6,000	720,000	1860	6,695	871,382
1856	6,177	821,541	1861	7,450	910,762
1857	6,582	895,152	1862	8,476	983,216
1858	6,920	823,480	1863	10,006	1,170,702

"It appears from the above returns, that the produce of British tin mines has increased no less than 67 per cent. in the last ten years, and even 18 per cent. in 1863 over 1862. And this, notwithstanding our loss of a large customer in America, now cut off from us by the dreadful war prevailing in that country. In the face also of the large supplies of Straits and Banca, which can at any time be increased. It seems, therefore, obvious that the production of our Cornish tin mines has outstripped the demand. Whatever the case may be after the close of the American war, the market is now over-supplied with tin; or so largely supplied that high prices for tin cannot be maintained. The conclusion is unavoidable, that many of the non-paying and poorer class of tin mines will cease to work, after some struggling for continued existence; whilst the mines that are so far opened up, and so productive as to be calculated to pay for working, will have to be worked on the most economical system. The dressing processes of tin ores are very expensive; the utmost economy will here have to be exercised, and improved appliances to be sought out. In the underground workings also, the most judicious system will have to be pursued during this difficult period. Changes, in different ways, we may hope and expect will after a time bring about a better state of things. With the cessation of war in America, we may hope to regain a good customer. Improvements may be made in smelting, enabling tin ores to be dressed to a much lower per-centage for the furnace, and thus reducing the cost of dressing to the miner. In fact, in the reduction of the cost of dressing, combined with judicious mining, and

perhaps also the advantage of tin ticketings, must now consist the hope of the miner, for any degree of success whilst having to sell at low prices in an over-supplied market. Our commercial treaty with France, enabling, since last Saturday, tin, copper, lead, iron, &c. to be imported at about a third less duties than formerly into that country, will probably strengthen the market for tin in France; whilst the restoration of peace to America, whenever it may happily occur, there is no doubt will have a great effect in increasing the demand for Cornish tin. In the interim, however, as we have before said, many mines will cease working, because with their limited productiveness, they cannot exist on low prices for tin; and their shareholders will only respond to calls for a certain period.

"Another view of the question has been taken by some of our correspondents. It has been said that enormous profits are made by the tin smelters, and that they ought to be content with less, and give better prices to the miner. There is no doubt that tin smelters in former times have amassed great riches; but the circumstances connected with trading operations have considerably changed, and probably the profits of tin smelting are not what they once were. Tin ticketings however, would undoubtedly give much satisfaction to the tin miners, as placing them on an equality with the copper miners with regard to the sales of their ores. Why should not the tin smelters concede this point, and thus give the miners the idea that they are disposed to deal with them fairly?

"We some time ago gave statistics of the number of tons which are smelted by the various firms yearly, but we have since been informed that there was some inaccuracy in the figures, and we are now enabled to correct them, and shall thus conclude our present remarks. The black tin smelted being about 15,000 tons a year, we are informed that the following is about the quantity smelted by each company:—

	Tons.
Messrs. Bolitho, Sons, and Co., who are probably the largest smelters, and who have works at Chyandour, Angarrack and Calenick .	3,900
Messrs. W. G. and F. M. Williams, who have works at Truro and Mellanear	3,800
Messrs. Daubuz and Co., with works at Truro and Treloweth .	1,750
Messrs. Enthoven and Co., at Charlestown	1,500
Messrs. R. R. Mitchell and Co., at Stable Hobba, near Penzance .	1,650
Messrs. Tregoning, Sampson, and Co., at Bissoe	950
Messrs. Waters, Lanyon, and Co., at Redruth	650
Messrs. Gatley and Bawden, at Truro	800
Total . .	15,000"

With regard to the prospects of mines there are few alterations to notice:—At *Great Wheal Vor* the lode in Ivey's shaft, sinking below the 184, turned out, for the last 3 feet sunk, 6 tons 4 cwt. of black tin, which even at present prices shows a money value of 800*l.* per fm. In the 162 driving west of Metal shaft the lode is 4 feet wide, and worth upwards of 200*l.* per fm. The stopes throughout the mine are looking well. Such a tin mine as this has not been seen in Cornwall during the present generation. At *Prosper United* the lode in the 70 west of Hand's shaft is worth 10*l.* per fm. for tin. The lode in the 60 west is 3 feet wide worth 2 tons of copper ore per fm.

At *Wheal Seton* the 160 east of sump winze is worth 15 tons of good copper ore per fm.; the 160 west is worth 13 tons; the 160 east of Tilly's shaft, 6 tons; the 160 west 9 tons; or, in the aggregate, 44 tons per fm. for the ends alone. At *West Seton* the 110 west is turning out 8 tons per fm.; and Hidderley's shaft about 7 tons per fm. The different ends, stopes, and winzes are yielding, in the aggregate, upwards of 50 tons per fm. At *New Seton* there is a kindly lode in the 70 west, and in a winze below the 62. The 52 fm. crosscut is reported to be getting very near the new south lode.

At *East Grenville* the 60 west is reported worth 2 tons of ore per

fm.; the 55 west 35*l.* per fm. The ore has been cut in the 75 west, and, although not yet much to value, is of the same character as in the level above. At *Wheal Grenville* the 110 west is stated to be worth 15*l.* per fm.

At *Dolcoath* the different ends are worth in the aggregate 224*l.* per fm. The tin ground seems to be about 60 fms. high, and worth, on an average, about 25*l.* per fm.—apparently much below the average value a short time since; but the improved machinery on the mine for stamping and dressing meets, to a great extent, the falling off in the value of the tin stuff. *Tincroft* is stated to be looking very well. In the 195 east of engine shaft, the lode is worth 30*l.* per fm. for tin; and the 162 east of Martin's east shaft 45*l.* per fm. The produce of the tin stuff raised in this mine is said to be 2°/₀ of black tin, worth 25*s.* per ton as raised from the mine.

At *Wheal Basset* only one of the ends is reported as being of any value, and that 1 ton per fm.; but the pitches throughout the mine, both for copper and tin, are still producing the usual quantities. At *East Basset* the tribute pitches are not looking so well. At *Copper Hill* the 70 west on the north lode is worth 1 ton per fm.; the winze in the bottom of the 80 on Michell's lode 2 tons per fm. At *Wheal Uny* a branch of ore, 1 foot wide, is said to have been intersected in the 58 cross cut south. *East Carn Brea* is reported to be looking better, but the lode is not yet cut in the 70. At *West Tolgus* the bottom of the mine is looking exceedingly well.

At *Clifford Amalgamated* Captain John Richards considers the prospects generally to be much better than they have ever been since the amalgamation. The engine shaft, below the 212, is worth 14 tons per fm., and the 212 east, on the north lode, 8 tons. In other parts of the mine there is what may be termed a perfect "lane of ore," one stope in the bottom of the 200 being worth 7 tons per fm., and three stopes in the back of the 212, 36 tons per fm. There is also a winze below the 200 worth 13 tons per fm., and three stopes in the back of the 220 worth 20 tons per fm. each, of ore of a produce of from 11°/₀ to 12½°/₀. This splendid mine would be amongst the most profitable in England if it were not for the excessive cost entailed by its depth, great heat, and the immense quantity of water. At *Great Wheal Busy* the main part of the lode in the 140 east of Harvey's has been intersected, and as far as seen is worth 30*l.* per fm. for tin. At *Hallenbeagle* there is reported to be a good lode in Stone's shaft, and also at the eastern shaft. At *North Treskerby* the purser states that the 22 fms. of ground driven through in the 100 fm. level are worth, on an average, 30*l.* per fm. The agents report that they believe they are now driving the 100 fm. level through the largest deposit of ore that has ever been discovered in this mine, and they are nearing the Elvan course, in the neighbourhood of which lodes in this district are thought never to have failed to make large deposits of ore.

Among lead mines in the Chiverton district, at *West Chiverton* the 80 west on Williams's lode is reported worth 60*l.* per fm. At *Wheal Chiverton* the progress in clearing Murray's shaft is stated to be now more satisfactory. The promoters of this mine seem to have strangely underrated the work they had to do before any result could be arrived at. *North Chiverton* is said to be improving. In the Liskeard district, *Wheal Mary Ann* is said to have improved in the bottom levels.

Among mines in the eastern part of the county, in *East Caradon* all the ends are poor on the caunter. The 60 east on the south lode is worth 6*l.* per fm., and four ends on the new lode are valued in the aggregate at 33*l.* per fm.; yet such a mine as this still sells for ,000*l.* It is just about two years ago since it was selling at

338,000*l.*, and as the dividends paid since that period have only given interest on that sum at the current bank rates, those who purchased then have already incurred a loss of upwards of 200,000*l.* The ultimate loss will certainly far exceed 300,000*l.* Our readers will remember at the time how we protested against the monstrous misrepresentations by which this fallacious price was bolstered up, and the amount of abuse we received in consequence. Although the "bitter end" is by no means yet come, we ask even now, Who was right? At *Marke Valley* the 100 east on Marke's lode is worth 1½ tons per fm., the 100 west, 2 tons. At *Fowey Consols* it is reported that in working a tribute pitch in the 240 west on Trathan's lode, a side lode has been discovered which will apparently make west in whole ground for nearly 50 fms. It is stated to be a promising lode, 2 feet wide and worth 12*l.* per fm. At *Wheal Polmear* a good bunch of ore has been discovered at the western shaft, 40 tons having been raised out of about 25 fms. of ground. This is very welcome, as the old bunch of ore is nearly worked out.

We omitted last month to state that *Tywarnhaile* mine, after an enormous expenditure in plant and machinery, is advertised for sale. *Tyringham Consols* also is to be abandoned. Fifty shares in *Wheal Curtis* were offered for sale by auction at Truro but found no bidder. Thirty-one *Cook's Kitchen* shares were sold by auction and realised from 11½*l.* to 12*l.* per share, the buyer to pay a fee of 5*s.* per share. Last year they were upwards of 30*l.* per share. One share in *West Tolgus* was sold by auction in the Stannaries Court for 51*l.*, the buyer to pay the last call of 30*s.*

Among transactions at mine meetings:—At *South Seton* meeting (on October 6th) a vote of thanks was passed to Mr. Matthews, the purser, for having disposed of the late Mr. Tippet's 50 shares in such a satisfactory manner. At *Charlotte United* meeting (on October 11th) it was resolved to sell the mine and materials. At *Polmear* meeting (on October 18th) the banking account was transferred from the Devon and Cornwall to the South Cornwall Bank, St. Austell. At *Fowey Consols* meeting (on October 24th) it was stated that although during the last four years ores to the amount of 117,246*l.* had been raised (upon which dues to the amount of 4,571*l.* had been paid) the working had incurred a loss of 3,936*l.* It was resolved in consequence that before making any additional outlay application be made to the lords for a reduction of dues. At *New Seton* account, the adventurers resolved that Captain Charles Thomas should be requested to inspect the mine before each account. At *North Basset* meeting (on October 26th) Captain Wm. Roberts was appointed chief agent in the room of Captain G. Davey, resigned.

The only new undertaking announced during the month is the *Noble Dale* Mining Company (Limited), with a capital of 10,000*l.*, in shares of 5*l.* each. The purchase money is to be 2,500*l.*, of which 1,000*l.* is to be in paid-up shares of the company. The sett is stated to comprise the New Wheal Grylls sett, with the addition of 200 fathoms on the western continuation of Tolvadden lode.

WALES AND THE BORDERS,

SOUTH WALES.—The iron trade of this district has been very active during the last few weeks, and at all the works the men have been employed full time. In tin plates there is nothing doing, the demand for America having greatly decreased. The makers here have accepted some large orders for railway iron, and there has also been a good demand for bars, prices being firmly maintained.

It is stated that a large order for bars has been secured by the new proprietors of the *Penydarren* works, and active preparations are being made to complete the necessary repairs to the extensive establishment, when very probably the whole of the furnaces will be lighted. The *Pontnewynydd forge* has, it is said, been almost at a stop, only a few hands being employed. A dispute with the puddlers was the first cause of the stoppage, but the men are now prepared to go in on the terms offered, and therefore it seems that other difficulties have arisen as to carrying on the works. The *Victoria* works, the property of the Ebbw Vale Company, are being improved and extended.

There has been unusual briskness in the steam-coal trade, owing in a great measure to the strikes in Staffordshire, many contracts having been entered into with makers in that country, to deliver a regular supply for some months to come. A large business has also been done in house-coal, and the export-trade continues on the increase. The colliers continue to work regularly, and the attempts made on the part of the delegates from the Union to induce them to object to coal being sent to Staffordshire have completely failed. The *Rhondda* and *Lantwit* house coal collieries are in regular employ, and there are a good number of orders in hand, and in fact the only difficulty is the continued scarcity of coasters.

The monthly statement of the export trade of *Cardiff* shows that during September the total quantity of coal exported was 125,700 tons, of iron 10,474 tons, of preserved coal 3,120 tons, and of coke 337 tons. In comparison with the return for August there is a great falling off.

During September there were exported from *Newport* 24,708 tons of coal, against 20,149 tons in the corresponding month of last year. The shipments coastwise were 44,079 tons against 48,292 tons in September, 1863. The exports of coal from *Swansea*, were 47,528 tons, against 37,727 tons in the corresponding period of 1863. The shipments coastwise were 17,673 tons of coal, and 1,913 tons of patent fuel. The exports from *Llanelly* were 11,168 tons, and the shipments coastwise were 16,722 tons, showing a decrease on the corresponding period of last year.

The arrivals into Swansea include:—copper ore from Paposo, Hondeklip, Coquimbo, Aveiro, Chili, and Leghorn; copper regulus from Chili and Caldera; unwrought copper from Coquimbo; iron ore from Cherbourg and Redan; pig-iron from Antwerp; some casks of lead ore from Havre; and silver ore from Alicante.

GLOUCESTERSHIRE AND SOMERSETSHIRE.—The imports into Bristol include:—394 tons of pyrites and 218 tons of sulphur ore from Arklow; 409 tons of sulphur ore from Pomaron; 2783 tons and 2,539 bars of iron from Gothenburg; 51 barrels of sulphur from Liverpool; 1,000 slabs of tin from Rotterdam; copper ore from Leghorn; 40 tons of copper slag from Newcastle; 832 tons of iron from Archangel; 125 tons of sulphur from Girgenta; 814 bars of iron from Stockholm; 100 tons of coal from Cardiff; 52 tons of silver lead ore from Plymouth; 54 tons of lead ore from Maryport; and 80 tons of pig-iron from Barrow. During the month of September, 844 tons of coal, and 390 tons of iron were exported from Bristol, as against 1,948 tons of coal and 911 tons of iron in August showing a *decrease* of 1,104 tons of coal, and 521 tons of iron. Compared with the corresponding month last year when 801 tons of coal, and 3,545 tons of iron were shipped from Bristol, the above returns show an *increase* of 43 tons in the exports of coal, but a *decrease* of 3,155 tons in the exports of iron.

The strike at the *Foxcote*, *Writhlington*, and *Braysdown* Collieries, belonging to Messrs. Naish and Wait, came to an end at the beginning of October, after lasting about eighteen weeks. It arose from a dispute connected with the quantity and weight of coal at the Foxcote

pit, the men requesting that a weighbridge might be placed at the top of the pit, so that they might know the exact quantity of coal each one sent to the surface. The owners, however, refused, and an immediate strike ensued, not only at Foxcote, but at the Braysdown and Writhlington pits, and the men joined the union. The owners, in their turn, determined not to employ a union man, discharged the whole and closed their pits. Although the men have been liberally supported during their struggle by the miners of Wales and the neighbourhood, they have, with the exception of a few of the leaders, whom the masters will not accept, conceded in every respect to their views, left the union, and have gone to work on precisely the same conditions as when they stopped.

The *St. Cuthbert* lead works, on the Mendip Hills near Wells, where the old slags and mining débris of the Priddy Minery are being treated, 5 new Castilian furnaces, a 30″ cylinder steam engine with 2 blast cylinders, and one of Mr. Frederick Bennett's patent condensers, are in course of active erection. One old furnace blown by a fan is now in operation, which, during the past half year has given the following yield of good soft pig-lead:—

March—25 tons 3 cwt 3 qrs	May—20 tons 10 cwt. 1 qr.	July—21 tons 0 cwt 3 qrs.
April —25 „ 6 „ 2 „	June—19 „ 10 „ 2 „	Aug.—18 „ 13 „ 4 „

or an average of nearly 22 tons per month. With the 6 furnaces and the new steam blowing-engine, it is expected that the yield will reach 120 tons of pig-lead per month.

MIDLAND COUNTIES, SOUTH LANCASHIRE, AND SOUTH YORKSHIRE.

STAFFORDSHIRE AND WARWICKSHIRE.—The coal trade of the district is as active as possible during this unprecedented strike, any price can be got for coal, buyers ordering without reference to terms. The colliers' strike may now be considered practicaily at an end, although we fear the seeds of future misunderstanding still remain. Want of space prevents our referring further to the subject this month, but we shall give a detailed original communication on this important matter in our next number.

The demand for finished iron has not been so active since the quarterly meetings. Although merchants' stocks are bare, they seem determined not to increase them until affairs are a little more settled. Prices remain firm, and most of the works appear to be working full time.

The quarterly meetings of the *Staffordshire Ironmasters* have been held during the month under circumstances more unsatisfactory and depressing, perhaps, than was before experienced. The colliers' strike has had most damaging effect upon the trade; the mischief arising from it is increasingly felt daily, and even under the most favourable circumstances it will be a very long time before the district recovers from the shock. At *Wolverhampton*, on the 12th, attendance was not large, and very little business was transacted, the ironmasters not being particularly anxious to take orders while there is so much uncertainty about their execution, which must necessarily be the case if the strike continues. It was stated that the principal ironmasters are moderately supplied with orders; but it was thought that if the colliers were all in there would not be sufficient to keep the works in full operation, the demand on account of the export trade being limited.

The market for pig-iron was extremely dull; few sales were reported, and, notwithstanding the reduction which has taken place, prices have not materially improved. It appears that in the district west of Dudley there are 14 furnaces only in blast out of 56. The colliers' strike was of course much discussed, and the prevailing opinion was that it will soon be over. A good number of the men in this—the thin coal district—have gone in; on the Dudley side also the men are dropping in at Lord Dudley's pits, and at some other of the collieries in that locality.

At *Birmingham*, on the 13th, there was a large attendance of the trade, Liverpool and London firms being well represented, as well as sections of the trade in other of the iron-producing districts. The quietude which prevailed at Wolverhampton was repeated here, not the slightest animation having been experienced from the commencement to the close of the meeting, and only a very moderate quantity of iron was sold. Producers said that they were not anxious to take orders until the strike is over, enabling them to calculate with a greater degree of certainty relative to the price and supply of fuel. But it is no less certain that consumers were not eager to buy, many of them entertaining the opinion that they will be able to do better towards the middle of the quarter. Towards the close a few orders were given, but the transactions fell decidedly short of the average.

For pig-iron, the make of South Staffordshire, there was a little more inquiry, and prices were firmer. For Shropshire pig there was the usual steady demand.

At *Dudley*, on the 15th, the attendance was small, and no disposition was manifested to do business. Scarcely a transaction in finished iron was reported. A few contracts for plates have been entered into since the meeting at Birmingham, but it is generally admitted that the quantity of iron sold during the week has been unusually small, the ironmasters themselves evincing no more eagerness to sell than consumers were to enter into engagements. Most of the principal firms have a moderate supply of orders, and for the next month the trade will be quiet, as the export houses will avoid doing business as much as possible while the money-market remains in its present state.

The market for Staffordshire pig iron has not in the slightest degree recovered, notwithstanding the immense reduction in the make. The quotations are for common pigs, 3*l.* to 3*l.* 5*s.*; all mine, 3*l.* 10*s.*; better class, 3*l.* 15*s.*; for Shropshire iron (Lilleshall make), hot blast, 4*l.* 5*s.*; cold blast 5*l.*

NORTHERN COUNTIES, NORTH LANCASHIRE, AND NORTH YORKSHIRE.

NORTHUMBERLAND AND DURHAM.—The iron trade has been very buoyant on the whole, though towards the end of October a slight check was felt in consequence of the fluctuation in the money market. Owing to the strikes in Staffordshire, a large number of men are seeking employment in this district. At *Witton Park* the trade for plates and rails is reported never to have been better, and the masters have large orders on their books.

It is stated that Messrs. Fox, Head, and Co., are about to commence operations at their new Plate Mills, at *Newport;* and that Messrs. Barningham (Darlington Iron Works) are contemplating important additions. The *Consett Iron* Company have held their first half-yearly meeting when the chairman announced that the nett profits for the half-year amounted to 21,000*l.*, placing them in a position to declare a dividend of ten per cent. At *Grosmont* the first sod of new cast-furnaces for the Glaisdale ironworks has been cut.

The coal trade has been generally brisk, and the pits working well. The following table shows the state of the blast furnaces on October 14th.

Place and Owners.	In.	Out.	Total.
Eston—Bolckow and Vaughan	9	—	9
,, Clay Lane	6	—	6
,, South Bank Co.	3	—	3
Cargo Fleet—Jones, Dunning, and Co.	2	—	2
,, Cochrane and Co.	4	—	4
,, Gilkes, Wilson, Pease, and Co.	5	—	5
Middlesbro'—Bolckow and Vaughan	4	—	4
,, Hopkins and Co.	2	—	2
Port Clarence—Bell Brothers	6	—	6
Norton—Warner, Lucas, and Barrett	3	—	3
Stockton—Houldsworth and Co.	3	—	3
Ferryhill—J. Morrison	3	—	3
Newport—Mr. Samuelson	3	—	3
Thornaby—W. Whitwell and Co.	3	—	3
Darlington—South Durham Co.	2	1	3
Witton Park—Bolckow and Vaughan	4	—	4
Stanhope—Weardale Iron Co.	1	—	1
Towlaw—Weardale Iron Co	5	—	5
Consett—Derwent Iron Co.	8	10	18
Total	76	11	87

A meeting of delegates from the collieries in Northumberland was held on October 15th at Seaton Delaval, when, after a lengthy discussion on the Sleekburn question, a deputation was appointed to wait upon the committee of the Coal Trade Association for the purpose of trying to bring about an amicable settlement.

A first dividend of 9*d.* in the pound is announced as payable to the creditors on the estate of Mr. W. N. de Mattos, coal exporter, who failed at the end of last year. A further distribution is expected to be made in November.

SCOTLAND.

The iron trade has been very brisk, more so than for many years past, the demand far exceeding the supply. With few exceptions, all the blast-furnaces have been in activity, and those out of blast have mostly been under repair. At the *Dundyvan* works great improvements are going on; and a new blast-furnace is being built on a principle which, it is stated, is calculated to produce double the quantity of iron made by any other furnace in the country. The shipments foreign and coastwise of pig-iron from the various Scotch ports during October have been 60,810 tons, against 68,883 tons during the corresponding months of last year.

Coal has been in improved demand for home use and in fair demand for export. The shipments foreign and coastwise from the Scotch ports during October have been 93,720 tons, against 91,580 tons in the corresponding month of last year.

A large meeting of colliers was held at Dunfermline, on Oct. 21st., when delegates gave statements of the rates of wages, the length of hours worked, and the ventilation of their several collieries. From these statements it appears that the average wage is about 3*s.* 6*d.* per day, the day extending from ten to twelve hours. The aim of the miners is to restrict the day to eight hours, the smaller out-put which

this shortening involves giving an opportunity for raising the pay of the operative. It was resolved that a brisk agitation should at once be set on foot to secure these objects, and that in a month hence the west of Fife miners should meet again in Dunfermline to report progress.

With regard to the discovery of ironstone at *Rankiston*, referred to in our last, it is stated that in a bore of about 80 fms. two black-band ironstones have been discovered—the first 3′ 6″ thick, the second 2′ 6″. The first of these seams has been tested from the calcined stone, and 3′ of it yields 63·3% of metallic iron; the remaining cleave of 6″ yields 48% of metallic iron. The second seam is the Burnfoot position, and is well known in the district. In a different part of the same property, another black-band has been discovered 18″ thick, and a brown stone about 8″ thick, at the depth of about 10 fms.

CONTINENT OF EUROPE AND MEDITERRANEAN COUNTRIES.

FRANCE.—The position of the iron trade is still unsatisfactory, though at St. Dizier some slight improvement has taken place.

In the *Moselle*, five large furnaces have been put into blast, two at Hayange, two at Moyéuvre, and one at Styring, and there is a good demand for the iron of the district.

According to some statistical information which has been collected it appears that the number of blast furnaces in the *Haute-Marne* remained in 1863 at the same level as in 1862; that is at 77. The production, which in 1862 showed an advance of eighteen per cent. as compared with preceding years, was a little higher in 1863, and the approximate totals collected for the first half of 1864 indicate a further increase. The district has now, as in 1862, eleven rolling works, the production of which is, however, twenty-five per cent. above the level attained.

The Correctional Tribunal of Valenciennes has tried 29 pitmen employed in coal-mines near that town on a charge of coalition for obtaining an advance of wages, and of having used violence to compel other men to join them in a strike, when seven were sentenced to be imprisoned for six weeks, fifteen for a month, five for a fortnight, two for a week, and all conjointly to pay the costs.

BELGIUM.—The iron trade here continues in a very favourable condition, nearly all the works being in constant activity, and prices firmly maintained. MM. de Dorlodot have entered into one or two large contracts for the supply of rails. The *Hourpes-sur-Sambre* Company has a blast furnace in full activity, and a second is being repaired with a view to its being put in operation.

Great attention has lately been directed towards the Belgian coal-trade, in consequence of the competition offered by other countries. The *Northern* and *Luxembourg* Companies have just reduced transport rates for coal and coke having Brussels for their destination *via* Namur. From the North Belgian stations between Liége and Engis inclusively, the tariff will be uniformly 3*s.* 6*d*, per ton, being a reduction of more than 10*d.* per ton on present prices. It is stated that the *Teronnes* Colliery Company have made the discovery of two fine seams of rich coal in the neighbourhood of the new seat of working, called the St. Barbe. During the first seven months of 1864 the deliveries of coal and coke from the *Couchant de Mons* were 1,575,665 tons, of which 1,395,330 tons were coal, and 180,335 tons coke. These figures show an advance of 123,496 tons compared with the corresponding period of 1863.

NORTH AMERICA.

LAKE SUPERIOR REGION.—There is nothing new to report as to the mining operations in this district, which are being as actively carried on as the scarcity of hands will allow. The annual report of the *National* Mining Company of Lake Superior states that the aggregate sales of copper and silver for the year 1863 amounted to $185,027, and the expenses to $146,893, leaving a profit of $38,134.

UNITED (ATLANTIC) STATES.—The quantity of petroleum exported from the United States from January 1st to September 10th of this year amounts to 22,546,957 gallons, against 21,389,131 during the same period of 1863. The *McClintockville* Petroleum Company have declared their sixth monthly dividend of 1%.

CALIFORNIA AND BORDER TERRITORIES.—It is stated that a much smaller quantity of coal is now being taken from the *Monte Diablo* mines than usual. The chief cause of the falling off is attributed to the low price of coal in the San Francisco market.

Prof. Silliman left San Francisco on September 9th on a tour of inspection to the Humboldt and Reese River mines.

SOUTH AMERICA.

BRAZIL.—An accident has occurred at Morro Velho, one of the mines of the *St. John Del Rey* Company, by the falling away of some timber, resulting in the death of one of the English workmen and seriously injuring twelve others. The Brazilians were so terrified that they have refused to resume working the mine, consequently the water is again in, and this being the richest part of the mine, it will seriously affect the monthly produce. Immediately after the accident a large crack was discovered at Surface near Pengelly's shaft.

The *Anglo-Brazilian Gold* Company have received advices from Captain Thomas Treloar, which state that the produce for August amounted to 453 oitavas of gold.

At *Don Pedro North del Rey* the gold return for August amounted to 1,684 oitavas, being an increase of 101 oitavas on the preceding month. The operations generally have progressed vigorously.

AUSTRALASIA.

VICTORIA.—At *Port Phillip and Colonial* the quantity of quartz crushed during August was 4,175 tons, yielding 1,406 oz. of gold, or about 7 dwts. per ton. The receipts during July were 1,910*l.* 19*s.* 4*d.* payments 1,373*l.* 18*s.* 5*d.*; showing a profit of 537*l.*

SOUTH AUSTRALIA.—The directors of the Australian Companies have advices up to August 26th. At *English and Australian* there were five furnaces at work at Kooringa, and four furnaces and two refineries at the Port works.

From *Worthing* advices state that Legg's engine shaft at Brewer mine was down 62 fathoms, and the branches are greatly increased in size and number, yielding good quantities of ore. The stopes in the back of the 12 fathom level were yielding good grey ore and carbonates.

At *Kapunda* operations were progressing satisfactorily. The quantity of ore raised in June was 289 tons, of 17¾ % average produce. The quantity raised in July was estimated at about 275 tons.

Mr. Hargreaves reports that he has not found any payable gold-field in South Australia, though there are some promising spots upon purchased land near the Onkaparinga.

Record of the Mining and Metal Markets.

METALLIC-ORE MARKETS.

TIN ORE.—The standards for tin ore were again reduced on the 24th; 2*l.* on superior fine and 1*l.* on other descriptions, making present quotations:—

Superior Fine	... £97	Superior Common ...	£94
Second Fine	... £96	Second Common ...	£93

The following extracts from a letter in the *Mining Journal* signed "Cymro," give a gloomy account of the prospects of this article:

"The present price of tin is perfectly justified by the state of the market and is the inevitable result of an excess of supply over demand. Until this is remedied, which, under existing circumstances, is neither imminent nor probable, very much lower prices must be expected and prepared for. The production of tin *in* Cornwall during the last five years, has increased say from—

1860	6,675 tons.	1863	10,006 tons.
1861	7,450 ,,	1864 ... at the rate of	10,006 ,,
1862	8,476 ,,		

The import of tin has also at the same time been largely increased, say—

1860	2,911 tons.	1863	2,728 tons.
1861	3,653 ,,	1864 ... at the rate of	4,230 ,,
1862	4,394 ,,		

Making the total supply of 1864, 4,650 tons in excess of the supply for 1860, a quantity of itself sufficient to supply the requirements of the entire kingdom for the next nine months. Added to this, the Dutch Government having decided on quarterly sales, another 1,000 tons per quarter is placed on the market to find buyers, and to depress prices. The result of this excessive supply is obvious from the present state of the market. Straits tin has accumulated gradually, but surely, from month to month in the London warehouses; and, starting from a stock of 800 tons in 1860, worth 140*l.* per ton, we arrive to-day at a stock of 3,660 tons, altogether unsaleable at 96*l.*, while English tin is daily offered by the leading smelters at 2*l.* or 3*l.* below the official list prices.

The increase in the London stock has been as follows—

Jan. 1, 1860	800 tons.	Jan. 1, 1863	2,350 tons.
,, 1861	380 ,,	Oct. 1, 1864	3,660 ,,
,, 1862	1,585 ,,		

An excess of supply, therefore, being evident, either the production must be decreased or the consumption must be increased. As regards production: the Dutch Government, finding themselves with a declining revenue from the low prices realised for their Banca tin, naturally look to restore their finances by increasing the supply, which is practically inexhaustible, and can be delivered in London at 60*l.* per ton. As regards consumption: the price of tin does not affect the quantity consumed, for our statistics show that quite as much goes into use at 140*l.* as at 96*l.*, and while consumption has remained stationary, the exports show scarcely any increase, so the value of tin must continue to decline until the price either shuts off a large portion of the present excessive supply, or tin becomes sufficiently cheap to render it available for other purposes to which it has not yet been applied."

COPPER ORE.—At the five public copper ore sales included in our present number—four Cornish sales (on the 6th, 13th, 20th, and 27th) and one Swansea sale (on the 11th)—the number of tons of ore, number of tons of fine copper, average produce per cent., average cost per ton of ore, average cost per ton of copper in ore, average returning charges for the total number of tons of ore required to produce a ton of fine copper (calculated on Sir W. Logan's formula, see *Mining and Smelting Magazine* vol vi. p. 139) and the average total cost of a ton

of fine copper to the smelter, at each sale, and for the whole month (including the total amount of money realised), have been as follows—which show, as compared with the last month, a *falling of* in the quantity of fine copper of 129 tons 15 cwts ¼ qr., and in the amount of money of 13,419*l.* 18*s.* with a *decline* in the produce of ⅛ %, and in the cost of copper of 1*l.* 17*s.* 11½*d.*

Date.	Tons of Ore.	Tons of Fine Copper.	Average Produce %.	Average Cost per Ton of Ore.	Average Cost per Ton of Copper in Ore.	Average returning Charges.	Average Cost of Fine Copper.
Oct. 6	3,289	£211 19 0	6⅞	£5 2 11½	£79 17 8	£17 15 2	£97 12 10¼
„ 11	* 526	55 7 0	10½	8 13 0½	82 4 4⅛	14 15 0¼	96 19 5
	† 806	135 8 0½	16⅛	14 0 4½	83 10 3⅛	12 19 6	96 8 5
„ 13	2,403	166 9 0	6¼	5 10 4	79 13 1¼	17 4 4¼	96 17 5¼
„ 20	4,659	261 9 0	5⅝	4 8 8	78 19 11	18 18 2¼	97 18 1¼
„ 27	3,336	204 15 0	6⅛	4 15 1	77 9 3	18 2 11	95 12 2
	15,019	1,035 7 0½	6⅞	5 9 5	79 14 8½	17 5 0⅜	96 19 9
	Totals for the Month:		Averages for the Month:				
	Amount of Money: £82,554 9 0		* British and Irish Ores. † Colonial and Foreign Ores. ‡ Equal to 15*s.* 11½*d.* per Unit of Copper.				

LEAD ORE.—The prices of lead ores sold in October, compared with those of September, again show a general reduction.

COAL AND MINERAL OIL MARKETS.

LONDON, COAL.—Mr. J. R. Scott, Registrar of the London Coal Exchange, has favoured us with the following statistics of this market for the month of October, of which detailed particulars will be found in Mr. Scott's monthly published returns. The total quantity of seaborne coal, culm, and cinders imported into London during October, was 207,089 tons, against 309,614 tons during the corresponding month of last year—showing a *decrease* of 102,525 tons. The following are the particulars of the 207,089 tons imported during October:—

Newcastle ...	97,584 tons	in 180 ships		Scotland ...	812 tons	in 10 ships
Seaham ...	6,385 „	28 „		Wales ...	2,501 „	8 „
Sunderland .	61,017 „	138 „		Yorkshire ...	2,575 „	20 „
Middlesbro' .	5,030 „	16 „		Small ...	1,770 „	3 „
Hartlepool ..	27,847 „	96 „		Cinders ...	1,092 „	6 „
Blyth ...	476 „	2 „				

The quantity of coal imported by railways during the month of October was 230,928 tons, against 193,491 tons in the corresponding month of last year, showing an *increase* of 37,437 tons. The following are the particulars of the 230,928 tons imported during October:—

	Tons.		Tons.
London and North Western ...	88,551	South Eastern	2,022
Great Northern	94,277	South Western...	1,670
Great Western	17,603	London Chatham and Dover...	430
Great Eastern	14,287	Tilbury and Southend... ...	48
Midland	12,040		

ERRATUM.—In our last number the total quantity imported into London during September should have been 234,385 tons, instead of 222,500—showing a *decrease* of 39,802 tons instead of 51,687. The number of tons sent from New-

castle ought to have been stated at 102,644 in 209 ships, instead of 90,681 in 210 ships. The total quantity imported by railways and canals should have been 172,645 tons instead of 171,645.

On October 3rd the new ships arrived were 108; market active. Hetton Wallsend, 21*s.* 3*d.*; Haswell Wallsend, 21*s.*; South Hetton Wallsend, 21*s.*; Tunstall Wallsend, 19*s.*; Hasting's Hartley, 19*s.* On the 5th, new ships, 12; house-coal firm at an advance of 6*d.* per ton. On the 7th, new ships, 16. On the 10th, new ships, 25; there was a further advance of 3*d.* On the 12th, new ships, 68; market steady. On the 14th, new ships, 27; market continued steady. On the 17th, new ships, 51; there was a large supply in the market, and a steady business was done. On the 19th, new ships, 24; market quiet. On the 21st, new ships, 28; market dull, with a slight reduction in house-coal. On the 24th, new ships, 12; on account of the stormy weather, there was only a small supply of coal in the market, which sold readily. On the 26th, new ships, 8. On the 28th, new ships, 28; the continued short supply caused an animated demand in the market, with an advance of from 3*d.* to 6*d.* per ton. On Oct. 31st. the adverse weather having quite stopped supplies coming forward, the market was without a single cargo of coal for sale.

NEW YORK, *October 17th.* COAL.—The demand for house-coal has been extremely light, and prices have been lower at $9·25 to $11 per ton. Little has been done in foreign, and prices have been quite unsettled.

PETROLEUM.—The market for this article has been very active under a brisk demand for home trade and shipment. Prices have taken an upward tone and have now advanced to 10 to 12 cents per gallon. The stock in hand is small and higher prices are looked for.

BOSTON, *October 15th.* COAL.—There have been sales of English Cannel, in small lots, at $28 per ton. In Sydney and Pictou no business of importance has been transacted. Anthracite has been unsettled, and sales have been effected at $14 to $15 per ton.

PHILADELPHIA, *October 15th.* COAL.—The coal market has been at a complete stand still, stocks are accumulating, and prices are merely nominal.

PETROLEUM.—This article has been dull and neglected, and there has been little or no demand for shipment. Crude is quoted at 36 cents; Refined in Bond at 62 to 64 cents. and Free Oil at 75 to 80 cents.

CONTRACTS.—The Admiralty require the supply of 3,500 tons of coal—one-third North of England and two-thirds South Wales—to be delivered at the Cape of Good Hope; also 1,000 tons of South Wales and 500 tons of North of England coal for St. Paul de Loando; and 1,000 tons of South Wales and 500 tons of North of England coal for Barbadoes.

METAL MARKETS.

LONDON.—The past month has been one of unusual anxiety in the commercial world. The distrust engendered by the heavy fall in most articles of produce seemed for a time to have paralysed trade; and though confidence again appears somewhat restored, and more business has been doing during the last few days, there are still grave apprehensions for the month before us, causing transactions to be limited to the narrowest wants of operators. We should not, however, forget that, at the present moment, prices in our metal market have had a most serious decline; tin, copper, iron, spelter, have each fallen 15 to 30 per cent. from their highest point, and as money becomes cheaper—which contracted operations and a high rate of discount must eventually bring about—there is every probability of their recovering to a considerable extent.

IRON.—Welsh Bars have been in good demand during the past month, and makers are well supplied with orders. Prices steady at 7*l.* to 7*l.* 10*s.* f. o. b. Wales. Rails are well sustained in value, and rule from 7*l.* to 7*l.* 15*s.* according to section, specification, and time of delivery. The position of the Staffordshire iron trade has been most unsatisfactory, owing to the continuation of the colliers' strike, and the immediate future looks more threatening. Prices are well maintained and all makers are very cautious in entering orders.

Scotch pig-iron has fallen considerably, and after touching 50*s.* cash, has only improved to 50*s.* 6*d.*, and 51*s.* one month, while the prospects of the trade are by no means favourable, Swedish iron is very inactive, but not much changed in price. STEEL offers at 15*l.* 10*s*,

COPPER.—There has been no official change in the price of English. but smelters have undersold considerably, while the pressure to sell second-hand parcels has been such that the nearest actual price now is 85*l.* for tough, and 88*l.* for select. In foreign copper but little has been reported; the last sales have been—Burra, 91*l.*; Kapunda, 91*l.*; Walleroo, 88*l.* Chili has been well supported, and sales made from 82*l.* to 79*l.*; there are, however, buyers at the latter quotations.

TIN.—The depression in this Metal which we reported in our last, has continued without intermission during the whole of the past month, and even at the present moment, when prices have reached a moderate figure, it is difficult to meet with buyers unless at a sacrifice from last quotations.

In English Tin, no official change has taken place, and the demand has been fair considering the state of Foreign Tin; but sales can only be effected a couple of pounds under official quotations. Early in the month some small sales of Straits were reported at 98*l.* per ton; but after this the Market gradually gave way to 96*l.*, and, under a pressure of sales, the price has since declined to 94*l.* per ton. A parcel of slightly inferior changed hands at 93*l.* The principal demand has been for Export, home consumers requiring but little. As to Banca, there has been great pressure to get out of stock, and the fall has been fully equal to that in Straits; from 99*l.* we have gradually declined to 95*l.* at which the market closes buyers. The Dutch Market has kept its position better; a fair amount of business has been done from 60½fl. to 59½fl.

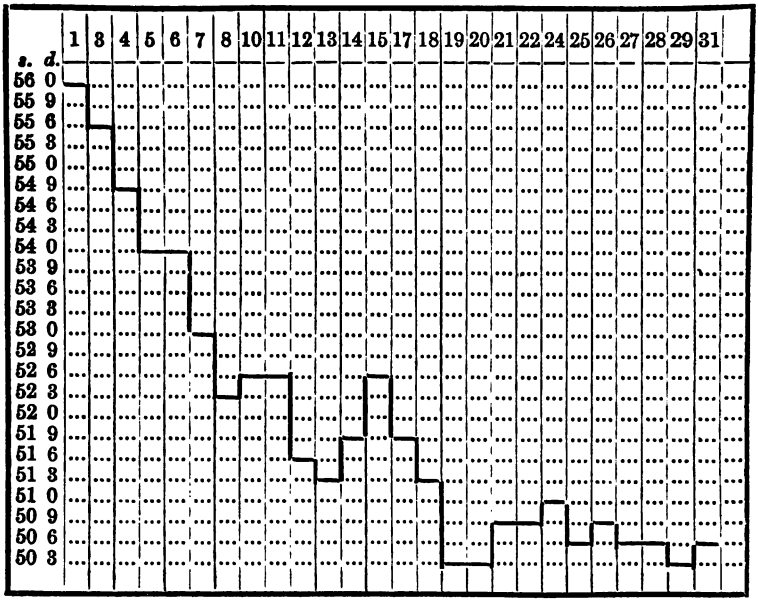
TIN PLATES have been very dull, with little or no demand for America, especially as to charcoal, and prices again in buyers' favour.

LEAD.—The market is very quiet and prices rather easier. Good English pig 20*l.* 5*s.*

SPELTER.—This market has sustained a serious fall, and the business reported has been most trifling. Consumers and exporters bought but little, and speculators have all been anxious to get out of their holdings. The market has been steadier the last few days, and the last sale reported is 700 tons spot at 21*l.*, and 100 tons, Aug. delivery 21*l.* 5*s.* There are inquiries for forward delivery, but sellers are cautious. Hull parcels are in more request than London for consumption, and the nearest prices are 21*l.* ordinary brands, 20*l.* 5*s.* special, and 21*l.* 10*s.* W.H.

GLASGOW. IRON.—The Scotch pig-iron market has been exceedingly depressed all through October, and prices show a very heavy decline. On the 1st the market opened quiet; M. nos., 56*s.*; No. 1, G.M.B., 56*s.* 6*d.*; No. 3, 55*s.* 3*d.*; No. 1, Gartsherrie, 61*s.* 9*d.*; No. 1, Coltness, 60*s.* 6*d.*; No. 1, Calder, 60*s.* On the 3rd the market opened pretty strong, and a good business was done for M. nos. at 56*s.*, but this, however, was not maintained, and prices declined to 55*s.* 6*d.* On the 5th there was quite a panic in the market, and

prices touched as low as 53*s.* 6*d.*, and after that steadily declined until the 8th, when business was very flat at 52*s.* After going down to 51*s.* on the 13th, and then recovering to 52*s.* 6*d.* on the 15th, prices of M. nos. rapidly receded to 50*s.* 3*d.*, the lowest price of the month, on the 19th. Since the latter date prices have fluctuated between 50*s.* 3*d.* and 51*s.*, closing at 50*s.* 6*d.* The following diagram indicates the daily fluctuations of this market, for it shows at a glance the highest cash prices of M. nos. for each day throughout the month:—



PARIS, *October 28th.*—In consequence of the state of the money market, metals have been in little demand and prices are merely nominal.

COPPER.—Tough cake and tile at (per 100 Kil.) 247-250 fr.; best selected 230 fr.; Lake Superior 260 fr.;

TIN.—Banca 265 fr.; English 250-257 fr.

LEAD.—French 53 fr.; Spanish 56 fr.

SPELTER.—Silesian 61 fr.

MARSEILLES, *October 27th.* IRON.—English pig-iron at (per 100 Kil.) 11 fr.; manufactured iron 23 fr.; Swedish 33 fr.

TIN.—Banca 280 fr.

ANTIMONY.—Regulas of antimony 120-135 fr.

COLOGNE, *October 28th.*—The metal market has been inactive and prices show but little variation.

IRON.—Charcoal iron and Spiegeleisen have been quoted at (per ctr.) 1¼-1¾ thlrs.; coke pig-iron, 1¼-1⅓ thlrs.; grey coke pig-iron, 1$\frac{4}{10}$-1½ thlrs.; Scotch pig, No. 1, 1$\frac{5}{10}$-1$\frac{7}{10}$ thlrs.

COPPER.—Paschkoff, 40 thlrs.; American, 39 thlrs.; English, 34 thlrs.; first quality rosette copper, 33 thlrs.

TIN.—Banca, 37 thlrs.; English in blocks, 36½ thlrs.

LEAD.—Refined, 6½-6⅝ thlrs.; unrefined, 6⅛-6⅜ thlrs.

ANTIMONY.—Regulus of antimony, 16-16½ thlrs.

BERLIN, *October 27th.*—The market here has been dull and there is nothing particular to notice. Towards the close of the month the tone of the market slightly improved in consequence of money being easier.

IRON.—Scotch pig-iron has not been in much request and prices are merely nominal. The closing quotation is (per ctr.) 49-50 sgr.; Silesian charcoal pig-iron, 52 sgr.; bar-iron has advanced 10 to 15 sgr.

COPPER.—Paschkoff 44 thlrs.; Demidoff 34 thlrs; Swedish 33-34 thlrs.; English 31½-32 thlrs.

TIN.—This metal has been flat and prices merely nominal. Banca 36 thlrs.; English 35 thlrs.

SPELTER.—Stocks are inconsiderable and producers are holding back from the market. W. H. 7⅛ thlrs.

BRESLAU, *October 27th.* SPELTER.—The market for this article remains very flat at 6⅞ thlrs.

HAMBURGH, *October 27th.*—There is no improvement to notice in the metal market, but the long inactivity has not been without its effect on prices which now incline in buyers' favour.

IRON.—Scotch pig has been quoted at (per ctr.) 2⅝-⅞ mk.; Staffordshire descriptions 7 mk.; Swedish 8½-8⅞ mk.

COPPER.—This metal remains without change. Demidoff 68 mk.; Paschkoff 85 mk.; Lake Superior 68-72 mk.; English 73 mk.

TIN.—Banca, 11½-11⅝ sch.; English 11½ sch.

AMSTERDAM, *October 27th.* TIN.—Banca nominally quoted at 59½ fl.

ROTTERDAM, *October 27th.* TIN.—Banca, 59½ fl.; Billiton and English, 60 fl.

LEAD.—Stolberger, 12½ fl.

SPELTER.—Silesian, 12 fl.

NEW YORK, *October 17th.* IRON.—The market for Scotch pig has been depressed and quite unsettled by the fluctuations in gold and exchange, and prices have fallen off to $58-$60. American quiet. In other descriptions a very heavy feeling prevails. Bar is quoted at $250 for Swedes; $185-$200 for Common, and $200-$215 for Refined English.

COPPER.—The stock of American ingot is greatly reduced, consequently there has been a firm market, but the decline in gold materially restricted business, and there are only small sales of Lake and Baltimore to report at per ton, $44½-$47½.

NEW SHEATHING and YELLOW METAL are firm at 50c.-52c. per lb.

BOSTON, *October 15th.* IRON.—The market for Scotch pig-iron has been dull, and the sales have been small at $75-$77 per ton cash for Gartsherrie and other brands No. 1; and American pig at $75-$77 per ton cash. Bar and sheet iron are very quiet, and prices are nominal.

PHILADELPHIA, *October 15th.* IRON.—The market for this metal has been very dull, and in the absence of sales prices of all kinds are nearly nominal, the want of orders in most branches of the trade almost entirely suspending the usual demand for pig-metal, which is entirely unsettled and offered at $1-$2 per ton lower without finding buyers, except in small lots for immediate wants.

STOCK AND SHARE MARKETS.

LONDON.—The extraordinary pressure on the money market led to an almost complete suspension of business in the mining share market during the first three weeks of October. For many days there

were scarcely any transactions, and when any did take place they were almost invariably at a heavy decline, except in the case of two or three stocks. Towards the close of the month business has slightly revived in sympathy with the general improved tone of the money market. As, however, the prices of market mine shares had, in a great majority of cases, been forced up to preposterous rates by brokers' combinations, it is doubtful if this market has as yet reached the lowest level of prices, although of course we may at any time have a revival of the same system of working up shares to fictitious quotations upon any great easement in the general money market. Many of the prices we give below are mere brokers' quotations and do not represent real business.

The following have been the principal alterations in prices:—

Advanced.

Great Wheal Vor	4	New Martha	¼
East Lovell	4	Great Laxey	1⅛
South Caradon	20	Panulcillo	⅝
Wheal Mary Ann	½	General	⅝
South Condurrow	⅜		

Declined.

Providence	3	Nanjiles	3
Sithney Metal	½	Grambler and St. Aubyn ...	2
Great East Lovell	1½	Tincroft	1½
Wheal Grenville	⅞	Stray Park	7
East Basset	10	Cook's Kitchen	1½
Wheal Buller	8	East Russell	⅝
West Frances	4½	Wheal Seton	15
South Frances	15	West Seton	10
East Caradon	5½	North Roskear	3
West Caradon	2⅜	East Carn Brea	¼
Gonamena	⅜	Wheal Uny	1¼
Wheal Chiverton	¼	St. John Del Rey	6
Herodsfoot	1½	Cobre	2¼
Wentworth Consols	1	United Mexican	¼

The most real and legitimate rise in prices has probably been in *Great Wheal Vor* shares, which have gone up 3*l.* to 34*l.*-35*l.*, having at one time advanced to 35*l.*-36*l.* *East Lovell* shares have also steadily advanced from their opening price on October 1st, of 8*l.*-8½*l.* to 11*l.*-11½*l.* *Providence* shares continue to recede, being last quoted at 36*l.*-37*l.* *Great Wheal Fortune* shares also show a slight decline to 7½*l.*-8½*l.* *Sithney Wheal Metal* shares, which were last quoted in August at 2*l.*-2½*l.*, have now declined to 1¾*l.*-2*l.* *Wheal Margaret*, 8*l.*-9*l.* *East Wheal Vor*, which were last noticed in June at 5*l.*-5¼*l.*, are now quoted at 2*l.*-2½*l.* *Great East Lovell* shares, which were also quoted last in June at 3¼*l.*-4*l.*, are now called 2*l.*-2½*l.* *New Rosewarne*, 10*l.*-12*l.*

There have been numerous transactions in *East Grenville* shares, though with but little fluctuation in prices. They close slightly lower at 7⅜*l.*-7½*l.* *Wheal Grenville* shares have again receded to 5⅞*l.*-6⅛*l.* *East Basset* shares opened at 60*l.*-65*l.*, and after considerable fluctuation closed very flat at 50*l.*-55*l.* There has been a heavy decline in *Wheal Buller* shares from their last quotation of 18*l.*-20*l.* to 10*l.*-12*l.* *West Frances* shares have receded to 28*l.*-30*l.* In *South Frances* shares there has also been a heavy fall from 40*l.*-50*l.* to 27½*l.*-32½*l.* *North Basset*, 1½*l.*-1¾*l.* *South Grenville*, 9*s.*-11*s.*

East Caradon shares show a considerable decline on last month's prices. They opened at 26¾*l.*-27¼*l.* but by the 17th had fallen to 22*l.*-24*l.* about which quotations they have slightly fluctuated and

close at 21½*l.*-22*l.* There has been a further advance in *South Caradon* shares to 540*l.*-550*l.* *West Caradon* shares are lower at 6¾*l.*-7*l.* *Gonamena*, 2½*l.*-2¾*l.* *Glasgow Caradon*, 3*l.*-3¼., *Marke Valley*, 4⅛*l.*-4⅜*l.*

West Chiverton shares have been very quiet and at one time were marked 55*l.*-60*l.*, but close nearly the same as last month 60*l.*-62*l.* There has been a further rise of 10*s.* in *Wheal Mary Ann* shares to 15½*l.*-16½*l.* *Wheal Chiverton* shares have been quoted lower at 5¾*l.*-6¼*l.* *Herodsfoot* shares, which have not been quoted since August, have now declined to 36½*l.*-37½*l.* In *Wentworth Consols* shares there has also been a decline to 7*l.*-9*l.* *Wheal Trelawny*, 19*l.*-20*l.* *North Chiverton* shares, which were last quoted in August at 1⅞*l.*-2⅛*l.*, are now quoted at 2*l.*-2¼*l.*

Clifford Amalgamated shares have again slightly declined to 29½*l.*-30½*l.* In *Nangiles* shares there has been a fall of 3*l.* from 27*l.*-28*l.* to 24*l.*-25*l.* *Grambler and St. Aubyn* shares are lower at 7*l.*-8*l.* *Great Wheal Busy*, 2¼*l.*-2½*l.* *Hallenbeagle*, 3¼*l.*-3½*l.* *North Treskerby*, 2½*l.*-2¾*l.*

The fall in the price of tin seriously affects the deep mines of the Camborne and Illogan districts. There has been a further decline in *Tincroft* shares to 16*l.*-17*l.* *Stray Park* shares have heavily receded, and close at 18*l.*-20*l.* *Cook's Kitchen* shares have also gone back to 11½*l.*-12½*l.* *South Condurrow* shares have improved slightly to 1¾*l.*-2*l.* *Carn Camborne*, 32*s.*-34*s.*

East Russell shares remain quiet, and close lower at 4⅝*l.*-4¾*l.* *New Martha* shares are a little better at 1⅝*l.*-1⅞*l.* *Lady Bertha* shares, which were last quoted in March at 7*s.* 6*d.*-10*s.*, are now quoted at 14*s.*-16*s.* *Devon Great Consols*, 580*l.*-590*l.* *Wheal Crebor*, 1⅞*l.*-2*l.* *Kelly Bray*, 10*s.*-12*s.* *Hingston Down*, 4⅛*l.*-4⅜*l.*

Wheal Seton shares have steadily declined from 210*l.*-215*l.* to 190*l.*-200*l.* *West Seton* shares have gone back a further 10*l.* to 205*l.*-210*l.* *West Tolgus*, 60*l.*-65*l.* *North Roskear* shares have again receded, and now stand at 18*l.*-20*l.* *North Crofty*, 2⅜*l.*-2⅝*l.*

There has been continued dulness in Redruth mines. *East Carn Brea* shares have declined to 6½*l.*-7*l.* *Wheal Uny* shares are also lower at 3½*l.*-3¾*l.* *Great South Tolgus*, 2½*l.*-2¾*l.* *North Downs*, ½*l.*-1⅛*l.*

Among Welsh and Isle of Man mines and undertakings, *Great Laxey* shares have improved to 16*l.*-17*l.* *South Darren*, 1¾*l.*-2*l.* *Vale of Towy*, 4*s.* 6*d.*-5*s.* 6*d.* *Rhymney Iron*, 28*l.* *Rhymney Iron New*, 8*l.*

Among the new iron companies there have been transactions in *Ebbw Vale*, at ½*l.*-¾*l.* dis. *Humber Ironworks*, 2⅛*l.* *Millwall Ironworks*, 4½*l.*

In foreign and colonial shares there has been still only a nominal amount of business done. *St. John Del Rey* shares have not maintained last month's advance, but have greatly declined leaving off as low as, 32*l.*-30½*l.*-31¼*l.* *Cape Copper* shares have gone back to 8⅝*l.* *Panulcillo* shares are better at 1½*l.* *Cobre* shares have receded to 27¾*l.* *Fortuna*, 3¼*l.* *United Mexican*, 4⅜*l.*-4⅝*l.* *Worthing*, ¾*l.*-⅞*l.* *Yudanamutana*, 1⅞*l.*-2*l.* *Don Pedro North Del Rey*, 10*s.* *Port Phillip*, 17*s.* 6*d.* *English and Australian Copper*, 1¼*l.*-1⅜*l.* *East Del Rey*, 7*s.* 6*d.* *Montes Aureos*, 1½*l.* *Scottish Australian*, 10*s.* *Alamillos*, 1⅛*l.*-1¼*l.* *Anglo-Mexican Mint*, 18½*l.* *Nova Scotia Gold and Land*, 3½*l.*-3⅞*l.* *General*, 23¼*l.* *Anglo-Brazilian Gold*, 5*s.* *Brazilian Land and Mining*, 11¾*l.*-11⅞*l.* *Dun Mountain Copper*, 5*s.*-7*s.* 6*d.*

A remarkable case of forgery and embezzlement, by Mr. *J. Allen Thornley*, a notorious speculator in the London Mining-Share market, was brought before the Guildhall Police Court during the month.

This person, who has absconded, appears by the depositions made before Mr. Alderman Challis to have defrauded Mr. Aaron Salomons, Manchester warehousman, of Old Change, in whose employment he occupied the position of chief clerk and cashier, to the extent of 40,000*l.* Thornley was well known as a correspondent under the initials X.Y.Z. to the *Mining Journal*, through whose columns he favoured his co-speculators with his valuable advice. He was (not inappropriately) also deeply mixed up in the notorious *East Caradon* mania.

CORNWALL.—The mining share market continued very depressed until the last week in October when it assumed a slightly better tone. A fair amount of business has been done in *East Grenville* shares which declined at one time to 7½*l.* but close stronger at 7½*l.*-7⅝*l.* *East Carn Brea* shares have been in moderate demand at 6¾*l.*-7*l.* *Hallenbeagle* shares are quoted at 3¼*l.* *West Tolgus* shares have been inquired for at 59*l.*-61*l.* *Wheal Seton*, 200*l.* *West Seton*, 210*l.* *Wheal Emily Henrietta*, 2*l.*-2¼*l.*

BIRMINGHAM.—*Muntz Metal*, 2⅛*l.*-2*l.* dis. *Nant Coal*, 7½*l.* *Leeswood Coal*, par.

LIVERPOOL.—*Mersey Steel and Iron*, 1*l.* pm. *Panulcillo*, ⅝*l.* pm.

MANCHESTER.—*Stavely Coal and Iron*, 16*l.* pm. *Ebbw Vale*, ¼*l.* dis. *John Brown and Co.*, 20¼*l.* pm.

DUBLIN.—In the Irish share market the following mines have been quoted:—*Mining Company of Ireland*, 28*l.* *Wicklow Copper*, 14½*l.* *Connorree*, 19*s.* 6*d.*-20*s.* *General Mining Company*, 4⅝*l.* *Killaloe Slate*, 18*s.* 6*d.*

NEW YORK, *October 17th.*—The share market here has been completely swallowed up in the mania for getting up companies for working the oil deposits of Pennsylvania. There are now more than 190 oil companies, representing a nominal capital of upwards of 20 millions sterling. Mining stocks in general have been inactive, and there is no appearance of their being better for the present. So little business has been done, that it would be useless to repeat quotations which vary so little from those of last month.

SAN FRANCISCO, *September 17th.*—The market has exhibited a fair degree of activity both in leading and low-priced shares.

A good deal of business has been done in *Gould and Curry* shares at prices varying from $1,135 to $1,285. *Savage* shares advanced to $1,300 but declined again to $1,200. *Chollar* shares have advanced to $650. *Potosi* shares have been dull and inactive at $770. *Sheba* shares have advanced to $100. *Nevada*, $30. *Baltic*, $24. *Buckeye*, $6. *Burning Moscow*, $29. *North American*, $25. *Wide West*, $26. *Imperial*, $142. *Hale and Norcross*, $425. *Antelope*, $12. *Real del Monte*, $18. *Golden Age and Empire*, $5. *Sierra Nevada*, $22. *Daney*, $27. *Belcher*, 775. [*** Quotations in Gold: Legal Tender Notes, 44⅛%.]

ANALYSIS OF BOARD OF TRADE RETURNS.

THE "Accounts relating to Trade and Navigation of the United Kingdom, for the month ended 30th September, and nine months ended 30th September, 1864," give, on analysis, the following results as to the Imports and Exports of Mining, Mineral, and Metallurgical products.

On the IMPORTS for the month, compared with the corresponding month in 1863, it will be observed that there has been an almost universal increase, there being a decline in only two articles, which call for no special notice. In unwrought copper there has been an increase from Chili of from 10,960 cwts. to 35,180 cwts.

On the EXPORTS for the month compared with the corresponding month of 1863. In pig-iron there has been a decrease to the United States from 22,422*l.* to 3,060*l.* In bar-iron there are decreases—to the United States from 35,564*l.* to 18,740*l.*, to British India from 39,855*l.* to 26,838*l.*, to France from 13,624*l.* to 2,102*l.*; and an increase to British North America from 28,832*l.* to 43,066*l.* In railroad iron there have been decreases—to the United States from 48,836*l.* to 14,094*l.*, to British India from 93,121*l.* to 62,142*l.*, to Russia from 32,325*l.* to 21,571*l.*, and to Spain from 25,800*l.* to 14,131*l.* In sheet-iron there have been decreases—to Russia from 23,540*l.* to 7,989*l.*, to the United States from 11,615*l.* to 5,309*l.*; and increases—to Australia from 21,651*l.* to 33,754*l.*, to British North America from 6,791*l.* to 15,292*l.* In sundry wrought iron, there has been a decrease to Russia from 22,120*l.* to 8,425*l.* In steel, there has been a decrease to the United States from 37,544*l.* to 22,922*l.* In unwrought copper, there has been a decrease to France from 72,168*l.* to 11,047*l.* In bar and sheet copper and yellow metal, there has been an increase to British India from 49,403*l.* to 161,272*l.*; and a decrease to France from 40,884*l.* to 15,042*l.* In pig and wrought lead, there have been increases—to France from 1,134*l.* to 16,917*l.*, to China and Hong Kong from 13,841*l.* to 25,163*l.*, to the United States from 28*l.* to 24,698*l.*, and to Russia from 5,787*l.* to 13,306*l.* In tin plates, there has been a decrease to the United States from 44,719*l.* to 10,015*l.* In salt there has been a decrease to British India from 24,880*l.* to 12,589*l.*

IMPORTS.—The quantities and relative increase and decrease of the imports of metals, metallic ores, and mineral products, for the month and nine months ended 30th September, have been as follows:—

—	Month ended 30th September.			Nine Months ended 30th September.		
	1863.	1864.	Increase (+) or Decrease (−)	1863.	1864.	Increase (+) or Decrease (−)
Brimstone.....cwt.	94,208	100,448	+ 6,240	587,293	619,599	+ 32,306
Copper Ore .....tons	6,010	3,290	− 2,720	58,689	49,762	− 8,927
Copper Regulus ..... „	2,117	2,292	+ 175	14,584	19,352	+ 4,768
Copper, unwrought and part wrought.....cwt.	21,500	50,560	+ 29,060	178,580	327,460	+ 148,880
Iron, in Bars, unwrought, tons	5,487	6,753	+ 1,266	28,765	34,110	+ 5,345
Steel, unwrought ..... „	271	859	+ 588	1,752	4,774	+ 3,022
Lead, Pig and Sheet ..... „	1,521	3,162	+ 1,641	18,677	23,769	+ 5,092
Spelter or Zinc ..... „	3,463	2,466	− 997	21,133	22,878	+ 1,745
Tin, in Blocks, Ingots, Bars, or Slabs.....cwt.	4,372	24,109	+ 19,737	34,691	66,941	+ 32,250
Silver Ore .....value in £	11,910	23,111	+ 11,201	190,381	186,059	− 4,322
Petroleum.....tuns	3,218	4,014	+ 796	29,876	14,323	− 15,553
Pyrites .....tons	10,134	27,105	+ 16,971	144,007	133,533	− 10,474
Quicksilver .....lbs.	589,621	761,902	+ 172,281	1,152,733	3,714,174	+ 2,561,441

EXPORTS.—The quantities, declared value, and relative increase and decrease of the exports of metals, minerals, and metallurgical articles of British and Irish produce and manufactures, for the month and nine months ended 30th September, have been as follows:—

	QUANTITIES.				DECLARED VALUE.					
	Month ended 30th September.		Nine Months ended 30th September.		Month ended 30th September.			Nine Months ended 30th September.		
	1863.	1864.	1863.	1864.	1863.	1864.	Increase (+) or Decrease (−)	1863.	1864.	Increase (+) or Decrease (−)
					£	£	£	£	£	£
Alkali: Soda ..... cwt.	191,785	166,270	1,608,193	1,647,413	77,224	67,706	− 9,518	666,391	685,914	+ 19,521
Coal, Cinders, and Culm ..... tons	794,195	811,882	6,239,329	6,615,915	357,853	379,546	+ 21,693	2,767,875	3,100,218	+ 332,117
Iron, Pig and Puddled ..... „	53,596	39,812	365,901	360,222	144,555	121,925	− 22,630	994,977	1,102,717	+ 107,740
Iron, Bar, Angle, Bolt, and Rod. „	30,514	24,682	245,086	225,001	236,943	226,042	− 10,901	1,838,668	2,080,111	+ 241,443
Iron, Railroad, of all sorts..... „	42,376	27,302	363,607	323,189	314,940	216,759	− 98,181	2,561,069	2,622,114	+ 61,045
Iron, Cast ..... „	5,475	7,206	64,213	53,581	52,717	72,715	+ 19,998	542,251	515,415	− 26,836
Iron Hoops, Sheets, and Boiler Plates ... ... „	11,272	11,678	100,929	95,096	146,747	166,025	+ 19,278	1,179,876	1,356,845	+ 176,969
Iron, wrought, of all sorts ... „	9,254	9,368	81,055	81,748	179,550	188,302	+ 8,752	1,557,762	1,685,275	+ 127,513
Iron, old, for re-manufacture ... „	369	139	11,779	6,012	1,485	621	− 864	44,105	29,227	− 14,878
Iron Steel, unwrought ... ... „	2,458	1,688	20,403	21,680	75,084	60,075	− 15,609	657,412	711,499	+ 54,087
Copper, unwrought, in Ingots, Cakes, or Slabs ..... cwt.	22,806	11,315	209,700	85,450	110,303	53,837	− 56,466	967,295	427,851	− 539,444
Copper, wrought or partly wrought, Bars, Rods, Bottoms, Pans, Plates, Sheets, and Nails; and mixed or Yellow Metal for Sheathing. „	42,199	60,232	414,832	400,596	194,773	291,911	+ 97,138	1,892,481	1,995,064	+ 102,583
Copper, wrought, of other sorts. „	1,412	2,414	8,214	14,649	7,738	14,224	+ 6,486	50,156	89,329	+ 39,173
Brass of all sorts ... ... „	3,163	5,984	32,245	29,759	16,882	32,050	+ 15,168	162,007	164,837	+ 2,830
Lead, Pig, Rolled, Sheet, Piping, Tubing, and Lead Shot ..... tons	2,179	4,927	28,285	27,532	46,486	106,766	+ 60,280	608,822	605,102	− 3,720
Lead Ore, Lead, Red, and White, and Litharge of Lead ..... „	555	617	5,020	5,188	13,515	15,927	+ 2,412	120,795	132,539	+ 11,744
Tin, unwrought ..... cwt.	8,466	9,268	61,810	69,895	48,194	49,391	+ 1,197	361,745	379,966	+ 18,221
Tin Plates ..... „	77,980	59,181	831,061	810,553	91,775	77,208	− 14,567	973,897	1,033,133	+ 59,236
Zinc or Spelter, wrought or unwrought ..... „	11,996	7,708	73,625	84,951	12,699	8,228	− 4,471	72,985	90,402	+ 17,417
Salt ..... tons	67,298	54,043	505,975	473,954	31,196	26,457	− 4,739	234,527	225,127	− 9,400
				£	2,161,259	2,175,715	+ 14,456	18,255,118	19,032,719	+ 777,601

LONDON PRICES CURRENT OF METALS.

From Messrs. JAMES and SHAKSPEARE'S, 10, Austin Friars, E.C., 1*st November*.

			Per Ton.		
IRON	Rails	in Wales	—	£7	5 0
Welch	Bars	„	£7 0 0 @	7	5 0
	„		7 17 6 „	8	5 0
	„		9 5 0 „	9	10 0
Staffordshire	Nail Rods		9 5 0 „	9	10 0
	Hoops		10 5 0 „	10	10 0
	Sheets		11 5 0 „	11	10 0
Scotch	Pig (mixed Nos. warrants) in the Clyde		— „	2	10 6
Swedish Hammered	Iron	Large sizes	— „	12	5 0
		Indian assortments	— „	12	5 0
	Steel	Faggot	— „	16	0 0
		In kegs (½ and ⅝ in.)	— „	15	0 0
			Per Unit.		
COPPER	Ore		— @	17*s.* 0*d.*	
	Regulus		— „	17*s.* 0*d.*	
	Barilla		18*s.* 3*d.* „	18*s.* 6*d.*	
			Per Ton.		
Chili Slab	at L'pool (for 96% pure Copper)		80 0 0 @	£82	0 0
Spanish	Cake		— „	85	0 0
Australian	Burra and P.C.C.		— „	90	0 0
	Kapunda		90 0 0 „	92	0 0
	Wallaroo		— „	90	0 0
	Cadia		— „	90	0 0
American	Baltimore		94 0 0 „	96	0 0
	Lake Superior		— none	—	
English	Tough Cake and Ingot and Tile		89 0 0 @	90	0 0
	Best selected Ingot		90 0 0 „	92	0 0
	Sheets, Sheathing and Rod		— „	98	0 0
	Flat Bottoms		— „	103	0 0
			Per lb.		
YELLOW METAL	Sheets (4 × 4 feet)		8*d.* @	8½*d.*	
	Sheathing and Rod		8¼*d.* „	9*d.*	
			Per Cwt.		
TIN	Common Blocks and Ingots		— @	101*s.*	
English	„ Bars (in barrels)		— „	102*s.*	
	Refined		— „	106*s.*	
Foreign	Straits, Fine		94*s.* 0*d.* „	95*s.*	
	„ (with 3 months' prompt)		— „	97*s.*	
	Banca		— „	96*s.*	
			Per Box.		
TIN PLATES	Charcoal IC, best		29*s.* 0*d.* @	30*s.* 0*d.*	
	„ IX „		35*s.* 0*d.* „	36*s.* 0*d.*	
	Coke IC „		22*s.* 6*d.* „	26*s.* 0*d.*	
	„ IX „		28*s.* 6*d.* „	32*s.* 0*d.*	
			Per Ton.		
LEAD	Sheet		— @	£21	0 0
English	Pig—W.B.		— „	22	10 0
	„ Other good brands		£20 5 0 „	20	10 0
Foreign	„ (German and Spanish) soft		19 15 0 „	20	0 0
English	Red		— „	21	10 0
	Shot		— „	23	10 0
	Dry White		— „	26	10 0
SPELTER	(Silesian) in Cakes		— „	21	0 0
ZINC	(Sheet) No. 9 and upwards		— „	28	0 0
			Per Bottle.		
QUICKSILVER (in bottles containing 75 lbs. each)			8 0 0 @	—	
			Per Ton.		
REGULUS OF ANTIMONY, French Star			— @	36	0 0

Tabular Abstract of Mining Accounts for the Month.

Date of Account.	Name of Mine, and Number of Shares.	Balances. Debit. £ s. d.	Balances. Credit. £ s. d.	Calls. Per Share. £ s. d.	Calls. Total. £ s. d.	Dividends. Per Share. £ s. d.	Dividends. Total. £ s.
	CORNISH & DEVON MINES.						
Sept. 17	Charlotte United (6,900)	—	—	0 5 0	1,500 0 0	—	—
„ 24	North Levant (2,000)	2,036 14 3	—	0 10 0	1,000 0 0	—	—
„ 26	Durlo (1,000)	1,064 0 4	—	0 10 0	500 0 0	—	—
„ 26	East Russell (4,000)	642 0 0	—	0 5 0	1,000 0 0	—	—
„ 26	East Florence (?)	—	140 13 1	—	—	—	—
„ 27	South Caradon (512)	—	6,827 18 4	—	—	7 0 0	3,584 0
„ 27	Gonamena (6,144)	—	185 1 6	0 2 0	614 8 0	—	—
„ 27	East Basset (512)	—	1,545 18 11	—	—	2 0 0	1,024 0
„ 27	South Tolgus (512)	44 0 0	—	—	—	—	—
„ 28	Tincroft (6,000)	—	3,091 2 10	—	—	0 10 0	3,000 0
„ 28	East Rosewarne (5,000)	—	1,390 16 5	—	—	0 2 6	625 0
„ 28	Caradon Consols (914)	—	64 12 1	0 10 0	457 0 0	—	—
„ 28	Wheal Reeth (240)	634 6 7	—	—	—	—	—
„ 29	East Providence (3,986)	346 4 3	—	0 5 0	996 10 0	—	—
„ 29	Craddock Moor (1,055)	—	522 8 10	—	—	—	—
Oct. 3	Caradon and Phœnix (12,000)	—	275 8 5	—	—	—	—
„ 3	Treworlis (2,048)	1,526 7 1	—	0 15 3	1,561 12 0	—	—
„ 4	Herodsfoot (1,024)	—	2,709 8 3	—	—	1 15 0	1,792 0
„ 4	Wheal Basset (512)	—	1,829 0 0	—	—	1 10 0	768 0
„ 4	North Treskerby (5,936)	—	243 5 7	—	—	—	—
„ 4	Illogan (6,000)	—	300 0 0	0 1 0	300 0 0	—	—
„ 5	Drakewalls (12,800)	—	688 8 2	—	—	—	—
„ 6	Great East Lovell (3,000)	—	2,853 9 10	—	—	—	—
„ 6	East Lovell (1,906)	152 19 3	—	—	—	—	—
„ 6	South Seton (400)	1,342 0 0	—	3 0 0	1,200 0 0	—	—
„ 7	West Tolgus (512)	—	—	1 10 0	768 0 0	—	—
„ 10	Dolcoath (358)	—	2,817 0 0	—	—	6 0 0	2,148 0
„ 10	Wheal Seton (396)	—	1,704 0 0	—	—	4 0 0	1,584 0
„ 10	Basset and Grylls (1,000)	—	52 18 7	—	—	—	—
„ 11	West Seton (400)	—	2,383 17 11	—	—	4 0 0	1,600 0
„ 11	Wheal Rose (2,000)	1,189 0 0	—	—	—	—	—
„ 11	Charlotte United (6,000)	2,741 6 8	—	—	—	—	—
„ 12	East Caradon (6,144)	—	7,011 10 6	—	—	0 17 0	5,222 8
„ 12	Bedford United (4,000)	—	648 5 7	—	—	0 2 6	500 0
„ 12	Marke Valley (9,000)	—	1,288 15 10	—	—	0 1 6	675 0
„ 12	West Caradon (1,024)	—	1,811 3 2	—	—	—	—
„ 12	Wheal Grylls (1,024)	895 9 9	—	1 0 0	1,024 0 0	—	—
„ 12	East Grylls (2,048)	359 13 8	—	—	—	—	—
„ 12	Great Grylls (3,072)	—	368 5 9	—	—	—	—
„ 12	Carn Camborne (6,000)	—	312 5 1	0 2 0	600 0 0	—	—
„ 12	West Rose Down (1,000)	—	51 8 5	0 17 6	875 0 0	—	—
„ 13	Cook's Kitchen (2,450)	999 8 7	—	0 10 0	1,225 0 0	—	—
„ 13	Trencrom (1,024)	367 0 0	—	—	—	—	—
„ 17	South Crofty (937)	—	—	0 7 6	351 7 6	—	—
„ 17	New Trevenen (960)	503 0 0	—	0 10 0	480 0 0	—	—
„ 18	Wheal Polmear (1,024)	619 3 4	—	1 0 0	1,024 0 0	—	—
„ 18	Treskerby (512)	65 0 0	—	1 5 0	640 0 0	—	—
„ 18	Fowey Consols (940)	—	794 18 6	—	—	—	—
„ 19	Clifford Amalgamated (2,900)	—	1,562 2 9	—	—	0 10 0	1,450 0 0
„ 19	East Carn Brea (6,000)	203 16 5	—	—	—	—	—
„ 20	Wheal Union (6,000)	424 19 3	—	0 4 0	1,200 0 0	—	—
„ 20	Crane (861)	1,189 7 4	—	1 7 0	962 7 0	—	—
„ 21	South Condurrow (6,138)	8,000 0 0	—	0 5 0	1,534 10 0	—	—
					19,813 14 6	—	23,972 8 0
	WELSH & OTHER MINES.						
Sept. 29	Cwm Erfin (867)	—	—	—	—	0 15 0	650 5 0
„ 30	Dale (35,000)	—	496 5 5	—	—	—	—
Oct. 4	Maes-y-safn (2,000)	—	—	—	—	1 0 0	2,000 0 0
„ 4	West Nanty (500)	—	—	2 10 0	1,250 0 0	—	—
„ 5	Coed Madog	—	189 7 10	—	—	—	—
	Vale of Towy (20,000)	855 4 5	—	0 1 0	1,000 0 0	—	—
„ 5	East Darren (300)	—	—	—	—	2 0 0	600 0 0
„ 17	Long Rake (2,000)	592 12 3	—	0 10 0	1,000 0 0	—	—
„ 18	West Cwm Erfin (1,000)	—	—	1 0 0	1,000 0 0	—	—
„ 20	Pentre Lygan (200)	101 9 8	—	—	—	—	—
„ 20	Billins (500)	—	133 0 0	—	—	—	—
	FOREIGN MINES.						
Sept. 26	United Mexican (43,174)	—	—	—	—	0 5 0	10,793 10 0
„ 30	Cape Copper (1,500)	—	1,399 9 8	—	—	—	—
Oct. 6	Fortuna (25,000)	—	8,781 0 0	—	—	—	—
„ 6	Linares (15,000)	—	4,504 10 1	—	—	—	—

Copper Ores.

Sampled September 21, and sold at Tabb's Hotel, Redruth, October 6.

Mines.	Tons.	Purchasers.	Price.
Clifford Amalgamated	118	2	£4 7 0
	88	1	9 10 6
	77	6	3 0 6
	76	9	4 9 6
	75	6	4 14 6
	72	3	6 17 0
	71	13	9 3 6
	65	1	10 11 0
	59	2, 6	4 5 0
	54	12	2 9 6
	52	12	2 17 6
	28	2	4 15 0
	18	1	3 16 6
(Consols)	42	5	9 8 6
	33	6	7 9 6
	2	5	40 3 6
Wheal Seton	69	3	4 17 0
	51	4, 6	5 13 6
(Pendarves)	89	4, 6	3 15 6
	79	4, 6	4 10 6
	78	10	1 6 6
	70	10	6 16 0
	65	2	8 0 0
West Seton	69	3, 5	14 3 0
	64	4, 6	4 12 6
	62	3	4 10 6
	60	12	2 17 0
	56	7, 9	8 13 0
	51	9	8 0 6
	50	3	4 3 6
	43	3	5 0 0
East Pool	75	1, 5	0 15 6
	57	6, 7	3 4 6
	54	6	2 19 6

Mines.	Tons.	Purchasers.	Price.
East Pool	47	6	£2 0 6
	37	2	4 16 6
	35	7	2 8 0
	22	6	3 15 0
Wheal Basset	66	10	5 9 0
	52	7	11 16 0
	42	10	4 17 0
South Tolgus	58	5, 7	8 1 6
	55	3	3 15 0
	47	4, 6	3 14 6
Dolcoath	47	6	4 11 6
	43	6	4 9 6
	24	7	6 0 0
South Crofty	54	3, 10	2 15 0
	31	12	1 14 6
	24	2	5 13 6
West Tolgus	59	1, 10	7 1 6
	41	1, 7, 11	7 1 6
North Crofty	60	10	6 4 0
	35	4, 6, 7, 12	1 13 6
East Basset	46	1, 5	5 13 6
	40	1	6 9 0
Tincroft	68	7	3 2 0
	12	5	10 16 6
New Treleigh	40	5	2 18 0
	12	11	5 17 0
Carne Camborne	34	2, 5	3 3 6
	11	5	7 8 0
Condurrow	33	2, 10	4 16 6
Crane	18	1, 5	10 14 6
	12	1, 5	5 7 0
Camborne Vean	13	3	2 4 6
Illogan Mines	5	5	1 18 0

TOTAL PRODUCE AND VALUE.

	Tons.	Amount.
Clifford Amalgamated	925	£5,546 3 0
Wheal Seton	501	2,416 17 6
West Seton	455	2,385 16 6
East Pool	327	842 16 0
Wheal Basset	160	1,177 0 0
South Tolgus	160	849 13 6
Dolcoath	114	551 9 0
South Crofty	109	338 3 6
West Tolgus	100	707 10 0
North Crofty	95	£430 12 6
East Basset	86	519 1 0
Tincroft	80	340 14 0
New Treleigh	52	186 4 0
Carn Camborne	45	189 7 0
Condurrow	32	154 8 0
Crane	30	257 5 0
Camborne Vean	13	28 18 6
Illogan Mines	5	9 10 0

EACH COMPANY'S PURCHASE.

	Tons.	Amount.
1 Vivian & Sons	329¾	£2,444 8 4
2 Freeman & Co.	329¼	1,715 16 6
3 Grenfell & Sons	425¼	2,062 0 0
4 Crown Copper Co.*	—	—
5 Sims, Willyams, & Co.	268	1,549 15 9
6 Williams, Foster, & Co.	803½	3,820 6 0
7 Mason & Elkington	286 5-6	1,732 0 8
8 Bankart & Sons	—	—
9 Copper Miners' Co.	155	£991 11 6
10 Charles Lambert	388½	1,874 18 3
11 Newton, Keates, & Co.	25¾	166 17 10
12 Sweetland, Tuttle, & Co.	205¼	522 5 8
13 Penclawdd Copper Co.	71	651 8 6
Total	3,289	16,931 9 0

Average Produce, $6\frac{7}{8}$ %.
Quantity of Fine Copper, 211 tons 19 cwt.
Ore required to make a ton of Fine Copper, 15 tons 10 cwts. 1½ qrs.

Average Price per ton of Ore £5 2 11½
Per Unit of Copper in Ore 0 15 11¾
Average Standard (nominal) 122 11 0

* The purchases made by No. 4 (Crown Copper Co.) are included in the total of No. 6 (Williams, Foster, & Co.), those firms being being identical.

Copper Ores.

Sampled September 28, and sold at Tabb's Hotel, Redruth, October 13.

Mines.	Tons.	Purchasers.	Price.
West Basset	65	4, 6	£7 0 0
	63	1	6 3 6
	60	10	4 17 6
	59	12	3 17 0
	58	13	7 8 6
	37	3	3 16 6
	35	5	10 12 0
	28	10	4 3 6
Carn Brea	61	1	8 3 6
	52	3	5 2 6
	50	6	3 18 6
	48	3	2 18 6
	47	3	4 3 6
	44	2	3 4 6
	37	10	4 4 0
	31	5, 7	8 2 0
	25	12	1 11 6
Prosper United	79	5	2 3 0
	75	1	1 16 6
	68	7	5 1 0
	61	7	4 8 6
	41	5	2 17 0
East Carn Brea	63	10	7 10 0
	45	3	4 2 6
	42	7	2 14 0
	38	6	2 11 6
	23	2, 7	3 15 0
	22	3, 9	6 18 6
Rosewarne Consols	45	1	13 12 6
	40	1, 6	11 5 0
	27	3	7 8 6

Mines.	Tons.	Purchasers.	Price.
Rosewarne Consols	17	2	4 9 0
West Fowey Consols	61	1	10 7 0
	60	8	3 13 6
Charlotte United	70	4, 6	3 12 0
	49	4, 6	7 10 0
Par Consols	75	9	6 2 0
	42	8	3 13 6
Rosewarne United	63	2, 6	4 14 6
	33	4, 6	9 18 0
Copper Hill	52	12	1 11 0
	38	5	7 5 0
Great South Tolgus	47	4, 6	7 17 6
	38	9	5 6 0
West Alfred Consols	56	3	1 2 0
Bampfylde	52	1	13 12 6
Wheal Anna	22	5	4 19 6
	15	1	2 0 0
South Carn Brea	34	7	5 4 0
Wheal Vyvyan	16	1	2 12 6
	9	5	6 6 0
	1	5	19 7 0
South Dolcoath	24	7	12 10 0
Wheal Agar	7	3	4 0 0
(Tehidy)	15	3	6 17 6
North Frances	14	2	4 3 6
Boiling Well	10	5	1 6 0
Boswidden	6	1	4 0 0
	2	1	23 0 0
	1	5	45 5 0
Camborne Consols	5	12	1 10 0

TOTAL PRODUCE AND VALUE.

	Tons.	Amount.
West Basset	405	£2,423 15 0
Carn Brea	395	1,885 16 6
Prosper United	324	1,036 18 0
East Carn Brea	233	1,107 19 6
Rosewarne Consols	129	1,339 5 0
West Fowey Consols	121	851 17 0
Charlotte United	119	619 10 0
Par Consols	117	611 17 0
Rosewarne United	96	624 7 6
Copper Hill	90	356 2 0
Great South Tolgus	85	571 10 6

	Tons.	Amount.
West Alfred Consols	56	£61 12 0
Bampfylde	52	708 10 0
Wheal Anna	37	139 9 0
South Carn Brea	34	176 16 0
Wheal Vyvyan	26	118 1 0
South Dolcoath	24	300 0 0
Wheal Agar	22	131 2 6
North Frances	14	58 9 0
Boiling Well	10	13 0 0
Boswidden	9	115 5 0
Camborne Consols	5	7 10 0

EACH COMPANY'S PURCHASE.

	Tons.	Amount.
1 Vivian & Sons	416	£3,344 11 0
2 Freeman & Co.	118	467 19 3
3 Grenfell & Sons	345	1,399 13 0
4 Crown Copper Co.*	...	—
5 Sims, Willyams, & Co.	251¼	1,302 10 0
6 Williams, Foster, & Co.	403¾	2,439 5 3
7 Mason & Elkington	256	1,372 4 0
8 Bankart & Sons	102	374 17 0

	Tons.	Amount.
9 Copper Miners' Co.	124	£735 1 6
10 Charles Lambert	188	1,037 6 0
11 Newton, Keates, & Co	—	—
12 Sweetland, Tuttle, & Co.	141	354 12 6
13 Penclawdd Copper Co.	58	430 13 0
Total	2,403	13,258 12 6

Average Produce, 6$\frac{14}{16}$ %.
Quantity of Fine Copper, 166 tons 9 cwts.
Ore required to make a ton of Fine Copper, 14 tons 8 cwts. 3 qrs.

Average Price per ton of Ore £5 10 4
Per Unit of Copper in Ore 0 15 11
Average Standard (nominal) 119 7 0

Sundry Copper Ore Sales.

Dates.	Mines.	Tons.	Price per ton. £ s. d.	Purchasers.	Amount of Money. £ s. d.
Oct. 4.	Great Laxey	120	3 13 0	Pocket Nook Co.	438 0 0
„ 11.	West Canada (ex Saranac)	70	16 5 0	Pascoe, Grenfell, & Sons	
	„ „	70	16 5 0	ditto	
	„ „	70	16 5 0	ditto	
	„ „	65	16 5 0	ditto	7,175 0 0
	„ „	65	16 5 0	ditto	
	„ „	65	16 10 0	ditto	
	„ „	35	16 10 0	ditto	
„ 18.	Parys Mines	140	7 0 6	J. Keys & Son	
	„	140	7 0 6	Mona Co.	2,864 15 0
	„	135	3 6 6	C. Lambert	
	„	135	3 3 6	Mona Co.	

* The purchases made by No. 4 (Crown Copper Co.) are included in the total of No. 6 (Williams Foster, & Co.) those firms being identical.

Copper Ores.

Sampled October 5, and sold at the Royal Hotel, Truro, October 20.

Mines.	Tons.	Purchasers.	Price.
Devon Great Consols.	131	5	£5 4 0
	127	1	4 9 6
	126	4, 6	4 17 0
	124	3	4 5 0
	121	4, 5, 6	3 12 6
	120	3	5 3 6
	118	7	4 13 6
	114	1, 11	4 12 0
	113	1	4 13 6
	112	4, 6	6 5 6
	111	4, 6	5 12 6
	109	3, 4, 6	4 13 6
	107	10	4 17 6
	103	4, 6, 11	5 5 6
	99	12	1 8 0
	82	8	3 3 0
	74	9	4 12 0
	51	3	13 16 6
	44	1	9 14 6
	36	1	11 10 0
East Caradon	95	5	3 18 6
	80	9	3 9 0
	75	8	6 6 0
	70	8	4 0 0
	62	12	3 15 6
	56	8	4 11 6
	37	5, 8	6 12 0
Marke Valley	90	2, 10	3 0 0
	87	2, 10	2 18 0
	86	12	2 19 6
	82	2, 10	2 15 6
	40	11	6 4 6
	25	1	3 2 6
Okel Tor.....	98	12	3 13 6
	96	7	2 7 6
	70	3	3 4 0

Mines.	Tons.	Purchasers.	Price.
Devon and Cornwall.	75	4, 6	£2 3 6
	70	3	2 4 6
	50	3	2 11 0
	37	7	8 1 6
	22	1	17 11 0
Bedford United	100	2	4 3 0
	98	7	4 16 0
Brookwood	50	5	2 5 6
	41	10	2 7 6
	40	13	2 3 6
	29	5	7 6 0
Wheal Edward.....	56	2, 6	2 10 6
	50	9	2 13 6
	40	9	6 11 0
Wheal Friendship ...	59	1	9 5 6
	57	4, 6	5 14 6
	4	1	20 2 0
Yarner	100	8	2 12 6
Kelly Bray	58	1	5 8 6
	29	1	2 3 6
New Cornish	62	1, 5	2 17 0
	25	13	2 8 6
Lady Bertha	67	3, 12	1 15 6
	8	11	5 17 0
South Bedford	38	2	4 14 0
	22	3, 13	1 1 0
North Robert	39	13	4 16 6
East Florence	27	10	4 3 6
	11	10	2 15 0
Fursdon	34	12	3 19 0
Collacombe	32	1, 5	3 8 0
Sortridge Consols.....	28	5	4 13 6
Hawkmoor	21	2	3 19 6
Great Tregune	7	5	9 7 6
Rabey's Ore	2	2	9 6 0

TOTAL PRODUCE AND VALUE

	Tons.	Amount.
Devon Great Consols.....	2,022	£10,237 11 0
East Caradon	475	2,135 16 6
Marke Valley	410	1,332 16 6
Okel Tor	264	812 3 0
Devon & Cornwall	254	1,131 5 0
Bedford United	198	885 8 0
Brookwood	160	509 16 6
Wheal Edward.....	146	537 3 0
Wheal Friendship	120	953 19 0
Yarner	100	262 10 0
Kelly Bray	87	377 14 6

	Tons.	Amount.
New Cornish	87	£237 6 6
Lady Bertha.....	75	165 14 6
South Bedford	60	201 14 0
North Robert	39	188 3 6
East Florence	38	142 19 6
Fursdon.....	34	134 6 0
Collacombe	32	108 16 0
Sortridge Consols.....	28	130 18 0
Hawkmoor	21	83 9 6
Great Tregune	7	65 12 6
Rabey's Ore	2	18 12 0

EACH COMPANY'S PURCHASE.

	Tons.	Amount.
1 Vivian & Sons	621	£3,813 0 6
2 Freeman & Co.....	318½	1,141 6 0
3 Grenfell & Sons	565 5-6	2,601 3 11
4 Crown Copper Co.*.....	—	—
5 Sims, Willyams, & Co..	445 5-6	1.987 2 2
6 Williams, Foster, & Co.	731	3,492 15 6
7 Mason & Elkington ...	349	1,548 16 6
8 Bankart & Sons	401½	1,651 12 0

	Tons.	Amount.
9 Copper Miners' Co. ...	244	£1,012 3 0
10 Charles Lambert	315½	1,136 18 0
11 Newton, Keates, & Co.	139½	739 2 2
12 Sweetland,Tuttle,&Co.	412½	1,182 8 3
13 Penclawdd Copper Co..	115	347 7 0
Total	4,659	£20,653 15 0

Average Produce, 5½ %.
Quantity of Fine Copper, 261 tons 9 cwts.
Ore required to make a ton of Fine Copper, 17 tons 16 cwts. 1¼ qrs.

Average Price per ton of Ore £4 8 8
Per Unit of Copper in Ore 0 15 9¼
Average Standard (Nominal) 128 0 0

* The purchases made by No. 4 (Crown Copper Co.) are included in the total of No. 6 (Williams, Foster, & Co.), those firms being identical.

Copper Ores.

Sampled October 12, and sold at Tabb's Hotel, Redruth, October 27.

Mines.	Tons.	Purchasers.	Price.
South Caradon	77	2	£14 5 6
	76	3	7 9 6
	75	7	6 6 0
	60	1, 5	14 5 6
	58	1, 6, 9	7 17 0
	49	1, 10	6 8 0
	42	1, 5	19 13 6
	41	9	5 18 6
Clifford Amalgamated	94	12	1 12 6
	75	5	2 13 0
	70	10	4 3 6
	60	1, 5	3 11 6
	58	10	2 7 0
	45	3, 4, 6, 7	4 12 6
	30	2	6 13 0
Phœnix Mines	102	1	3 1 6
	91	10	2 1 0
	70	1 4, 6	2 15 6
	59	2	2 10 0
	50	13	4 3 6
	38	10	2 8 0
Tywarnhaile	85	4, 6	1 19 6
	62	8	2 2 0
	48	4, 6	2 8 6
	41	4, 6	2 5 6
	35	7	5 16 0
	32	6	2 2 6
	30	6	7 13 6
West Damsel	71	3, 7	3 16 0
	59	4, 6	4 10 6
	56	11	3 16 6
	51	7	3 19 0
	43	3	4 14 6

Mines.	Tons.	Purchasers.	Price.
West Damsel	40	7	£4 1 0
Craddock Moor	84	6	5 13 6
	63	10	5 19 6
	45	9	7 7 0
	21	9	3 8 0
	14	1	7 7 0
Fowey Consols	80	1	4 19 6
	66	1	5 13 6
	64	5	5 19 0
Hallenbeagle	67	3	4 5 0
	61	7	4 7 6
	46	3, 11	4 13 6
	34	7	9 14 6
Great Wheal Busy	41	9, 11	3 4 6
	40	9	3 6 0
	37	3, 5	2 1 6
	31	10	1 4 0
	30	12	1 15 6
	2	5	33 18 0
Great North Downs	79	4, 6	3 0 6
	75	2, 4, 6	4 4 6
	19	6, 11	9 9 0
Glasgow Caradon	63	10	3 7 0
	58	10	2 18 0
	39	5	2 7 6
Boscawen	51	8	2 7 6
	31	2	2 17 0
	23	1	8 10 0
Falmouth and Sperries	34	1, 5	2 5 0
North Grambler	33	13	5 8 0
Grambler	16	3	7 7 6
East Wheal Ellen	16	5	3 18 0

TOTAL PRODUCE AND VALUE.

	Tons.	Amount.
South Caradon	478	£4,834 9 0
Clifford Amalgamated	432	1,402 3 6
Phœnix	410	1,141 18 0
Tywarnhaile	333	1,009 0 0
West Damsel	320	1,317 12 0
Craddock Moor	227	1,358 3 6
Fowey Consols	210	1,153 7 0
Hallenbeagle	208	1,097 6 0

	Tons.	Amount.
Great Wheal Busy	181	£499 5 0
Great North Downs	173	735 8 0
Glasgow Caradon	160	471 17 6
Boscawen	105	404 19 6
Falmouth and Sperries	34	76 10 0
North Grambler	33	178 4 0
Grambler and St. Aubyn.	16	118 0 0
East Wheal Ellen	16	62 8 0

EACH COMPANY'S PURCHASE.

	Tons.	Amount.
1 Vivian & Sons	450 5-6	£2,744 16 10
2 Freeman & Co.	221	1,109 1 6
3 Grenfell & Sons	291¼	2,037 18 11
4 Crown Copper Co.*	—	—
5 Sims, Willyams, & Co.	312½	1,827 13 9
6 Williams, Foster, & Co.	606	2,344 16 0
7 Mason & Elkington	342¾	1,823 8 2
8 Bankart & Sons	113	251 6 6

	Tons.	Amount.
9 Copper Miners' Co.	186 5-6	994 19 1
10 Charles Lambert	496½	1,655 19 6
11 Newton, Keates, & Co.	109	477 12 3
12 Sweetland, Tuttle, & Co.	124	206 0 0
13 Penclawdd Copper Co.	83	386 19 0
Total	3,336	£15,860 11 6

Average Produce, 6¼ °/₀.
Quantity of Fine Copper, 204 tons 15 cwts.
Ore required to make a ton of Fine Copper, 16 tons 5 cwts. 3¾ qrs.

Average Price per ton of Ore	£4 15 1
Per Unit of Copper in Ore	0 15 6
Average Standard (nominal)	122 8 0

Blende Sales.

Dates.	Mines.	Tons.	Price per ton. £ s. d.	Purchasers.	Amount of Money. £ s. d.
Sept. 30.	Miners	110	6 0 0	W. Kenrick	860 11 0
	„	20	5 5 0	H. Southern	
	„	6	3 11 6	Vivian & Sons	
	„	12	6 3 6	W. Kenrick	
	Roman Gravels	12	3 0 0	— —	42 0 0
Oct. 4.	Great Laxey	300	3 19 0	Vivian & Sons	1,185 0 0
	North Chiverton	50	5 12 0	ditto	560 0 0
„ 18.	Great Laxey	200	3 19 6	J. Collingburn	795 0 0

* The purchases made by No. 4 (Crown Copper Co.) are included in the total of No. 6 (Williams, Foster, & Co.), those firms being identical.

Copper Ores.

Sampled September 21, and sold at Swansea October 11.

Mines.	Tons.	Produce.	Purchasers.	Price.
Cobre	120	13	3	£11 2 6
	92	13¾	3	10 17 0
	83	13¾	3	10 17 0
	64	21¾	2	18 6 6
	65	21½	6	18 0 0
	67	18¾	7	15 5 6
(Precipitate)	14	50¼	5	42 5 0
Berehaven	86	11¾	5	9 14 0
	83	11½	7, 13	9 13 6
	88	10¾	6	8 16 0
	30	9¾	6	8 3 0
	85	9¾	6	8 2 0
Cuba Dust	109	14½	7	£11 18 6
Copper Slag	101	4½	10	2 15 0
	1	10¾	7	8 17 6
Spanish Ore	49	5	13	3 12 0
Cape Copper Co.	44	38½	2, 7	33 1 6
Cuba	2	60¼	5	48 8 0
Spanish	76	8¼	6	7 1 0
British Regulus	27	17¾	6	14 0 0
	13	23¾	6	20 0 0
Concordia	13	21½	5	18 16 0
Kanmantoo	8	43¼	6	37 15 0
British Regulus	12	26½	6	22 15 0

TOTAL PRODUCE AND VALUE.

	Tons.	Amount.
Cobre	505	£1,788 9 6
Berehaven	372	3,353 8 6
Cuba Dust	109	1,299 16 6
Copper Slag	102	286 12 6
Spanish Ore	49	176 8 0
Cape Copper	44	1,455 6 0
Cuba	2	£96 16 0
Spanish	76	535 16 0
British Regulus	40	638 0 0
Concordia	13	244 8 0
Kanmantoo	8	302 0 0
British Regulus	12	273 0 0

EACH COMPANY'S PURCHASE.

	Tons.	Amount.
1 Copper Miners' Co.	—	—
2 Freeman & Co.	86	£1,900 9 0
3 Grenfell & Sons	295	3,220 15 0
4 Crown Copper Co.	—	—
5 Sims, Willyams, & Co.	115	1,766 18 0
6 Vivian & Sons	404	4,645 0 0
7 Williams, Foster, & Co.	240½	3,461 5 9
8 British & For. Copper Co.	—	—
9 Mason & Elkington	—	—
10 Bankart & Sons	101	277 15 0
11 Charles Lambert	—	—
12 Ravenhead Copper Co.	—	—
13 Sweetland, Tuttle, & Co.	90½	577 18 3
14 Dan-y-Craig Smelting Co.	—	—
15 Penclawdd Copper Co.	—	—
16 Mona Copper Co.	—	—
Total	1,332	£15,850 1 0

Price per Unit of Copper in British and Irish Ores, 16*s.* 5½*d.*

British and Irish Ore required to make a ton of Fine Copper, 9 tons 10 cwts. 1 qr.

Price per Unit of Copper in Foreign and Colonia Ores, 16*s.* 8½*d.*

Foreign and Colonial Ore required to make a ton of Fine Copper, 5 tons 19 cwts.

*** The ticketing paper gives the produce of the 101 tons of Slag bought by Messrs. Bankart at 14¼ %, which is an obvious mistake. We have discovered the error too late to ascertain the real produce, but assume it to be 4¼ %.

No Sale on October 25.

Black Tin Sales.

Dates.	Mines.	Tons.	c.	q.	lbs.	Price per ton.	Purchasers.	Amount of Money.
Sept. 17.	Wheal Sidney	5	3	1	8	£63 15 0	Calenick Co.	£329 6 8
„ 21.	West Beam	3	4	2	4	65 12 0	Calenick Co.	
	„	3	6	2	7	65 11 6	Daubuz & Co.	643 2 9
	„	3	5	0	4	65 11 6	Harvey & Co.	
„ 22.	Trevenen	7	15	0	23	65 10 0	Enthoven & Sons.	
	„	1	0	1	3	48 10 0	ditto	557 9 3
„ 28.	Phœnix	9	18	0	27	55 2 6	Harvey & Co.	546 8 0
	Wheal Grenville	12	5	0	20	62 12 6	Bissoe Co.	
	„	2	13	2	23	52 10 0	ditto	908 13 9
	East Grenville	3	17	1	17	61 15 0	ditto	
	„	0	14	1	24	51 0 0	ditto	275 17 2
	Drake Walls	12	10	0	0	—	—	796 0 0
	Cuddra	6	0	0	18	61 10 0	W.G.&F.M.Williams	369 9 10
Oct. 1.	Pedn-an-drea United	8	0	0	8	—	Carvedras	489 0 7
„ 7.	Prosper United	7	17	3	4	59 15 0	Bolitho & Sons	
	„	2	1	1	1	50 0 0	ditto	574 10 6
	Cornubia	4	11	2	17	64 0 0	Daubuz & Co.	293 5 8
„ 13.	Pendeen Consols	4	10	3	24	55 0 0	Bolitho & Sons	
	„	4	5	0	17	55 0 0	Michell & Co.	484 6 3
„ 14.	Great Wheal Vor	10	19	2	15	66 5 0	Clyandour	
	„	1	10	3	20	57 5 0	ditto	
	„	11	8	1	7	66 5 0	Mellanear	3,281 2 9
	„	1	9	0	0	57 5 0	ditto	including
	„	11	0	1	19	66 5 0	Trereife	£2 3*s.* 8*d.*
	„	1	8	3	14	57 5 0	ditto	extra
	„	11	0	0	15	66 5 0	Treloweth	carriage.
	„	1	8	2	2	57 5 0	ditto	
„ 19.	East Wheal Vor	2	18	0	5	58 0 0	Harvey & Co.	177 7 6
	„	0	4	0	12	43 10 0	ditto	
„ 21.	Trevenen	9	5	3	1	65 10 0	Enthoven & Sons.	
	„	1	8	0	18	48 10 0	ditto	677 13 0
„ 25.	St. Day United	15	9	0	16	—	—	803 14 9
„ 26.	Wheal Grenville	10	18	1	9	62 0 0	Mellanear	
	„	2	12	1	4	50 0 0	ditto	807 10 11

Lead Ore Sales.

Dates.	Mines.	Tons.	Price per Ton. £	s.	d.	Purchasers.	
Sept. 30.	Roman Gravels	56¾					
	Minera	100	14	6	0	Walker, Parker, & Co.	
	"	100	14	6	0	ditto	
	"	91	14	6	0	ditto	
	"	100	14	6	0	ditto	
	"	48	14	6	0	ditto	
	"	21½	14	6	6	ditto	
	"	21¾	14	6	6	Brymbo Co.	
	"	8	11	0	0	Walker, Parker, & Co.	
	Bronfloyd	30	14	11	0	Mining Co. of Ireland	
Oct. 1.	Dyliffe	64	13	16	6	A. Eyton	
	"	40	13	14	0	Newton, Keates, & Co.	
" 4.	Great Laxey	100	25	7	6	Treffry's Trustees	
	Macsysafn	70	14	5	0	Brymbo Co.	
	"	70	14	2	6	ditto	
	New Laxey	7¼	14	15	0	Sims, Willyams, & Co.	
	"	7¼	14	15	0	Walker, Parker, & Co.	
" 7.	Harwood	10	12	12	6	Shield & Dunning	
" 10.	Frongoch	140	13	10	0	Panther Co.	
	East Darren	75	16	10	6	J. & J. Williams	
	Cwm Erfin	25	17	6	6	Treffry's Trustees	
	"	40	17	3	0	Sims, Willyams, & Co.	
" 11.	Wheal Mary Ann	46	27	18	6	ditto	
	"	30	11	4	6	Treffry's Trustees	
" 12.	Twelve Apostles (blue ore)	30	13	15	0	A. Eyton	
	" (white ore)	10	7	0	0	J. Hughes	
" 13.	Talargoch (Macsyrerwddu)	19	14	12	6	Newton, Keates, & Co.	
	" (Coetia Llys)	106¼	15	6	0	ditto	
	Deep Level	20	13	6	6	Walker, Parker, & Co.	
	Brynford Hall	9½	13	0	6	Brymbo Co.	
	South Kilmorey	8½	13	0	0	Walker, Parker, & Co.	
	Rhosesmor	60	13	18	6	A. Eyton	
	"	55	13	17	6	ditto	
	Parry's	21	13	14	0	Walker, Parker, & Co.	
	Bryn Gwlog	45	14	8	0	A. Eyton	
	Long Rake	30	13	12	6	ditto	
	Billins	15	13	16	6	Walker, Parker, & Co.	
	Merllyn	6	12	8	0	Newton, Keates, & Co.	
	North Henblas	15	12	4	0	Walker, Parker, & Co.	
	"	2	12	11	0	ditto	
	Pennant	12½	13	0	0	Brymbo Co.	
	Dog Pit	20	12	14	0	Newton, Keates, & Co.	
	Pwllywen Llan	21	13	13	6	Walker, Parker, & Co.	
	West Vowndg	25	13	15	6	ditto	
	Llangynog United	42	12	17	6	ditto	
	Llanerchyraur	24¾	13	9	0	ditto	
	Roman Gravels	20	13	7	6	ditto	
	Cwccoonoy	11¼	14	10	6	Newton, Keates, & Co.	
	Dyfngwm	13	13	2	6	ditto	
	Dyliffe	48	13	11	6	A. Eyton	
	Speedwell	8	12	0	0	Walker, Parker, & Co.	
" 14.	Cargoll	63	18	0	6	—	
	"	19	7	14	0	—	1,803 19
	"	2	7	10	6	—	
	"	1	7	1	0	—	
" 20.	Minera Boundary	37¾	13	5	0	J. Hughes	522 10
	"	2¼	10	5	0	ditto	
	Tallaker (Australia)	40	11	3	0	Sims, Willyams, & Co.	1,478 0
	"	86	12	0	0	ditto	
	Isle of Man Mining Co.	100	25	5	6	Stock & Co.	2,527 10
" 24.	East Logyllas	70	13	3	0	Panther Co.	920 10
	Glogfach	50	16	17	0	Sims, Willyams, & Co.	842 10
	Cwmystwith	120	13	6	0	ditto	1,596 0
" 25.	Great Laxey	100	25	2	6	J. & J. Williams	2,512 10
" 27.	Westminster	40	13	6	6	Walker, Parker, & Co.	533 0
	Mount Pleasant	30	13	16	0	Newton, Keates, & Co.	414 0
	Hendre Ucha	8	13	10	6	ditto	108 4
	Brynowyn	10	13	17	6	A. Eyton	138 15
	Pant-y-Mwyn	14	13	6	6	Walker, Parker, & Co.	186 11
	Nant-y-Car	3½	11	0	6	Newton, Keates, & Co.	54 18
	"	2¼	6	10	6	ditto	
	Dyfngwm	12	13	2	6	Walker, Parker, & Co.	157 16
	Llanerchyraur	13	13	10	6	ditto	175 16
	Cwccoonoy	6¼	14	9	6	ditto	90 9

FIG. 1

Section along **W. X. Y. Z.**

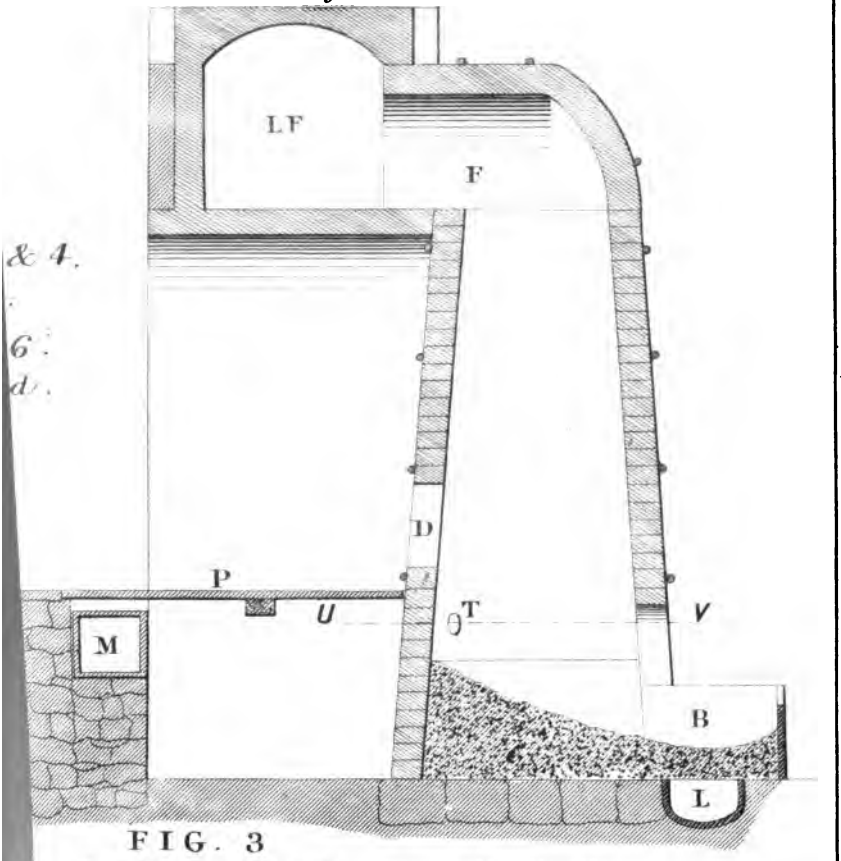
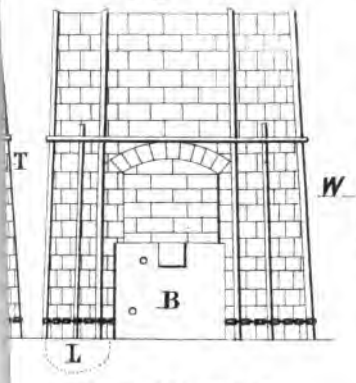
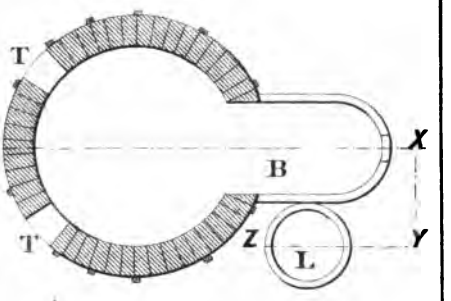


FIG. 3



Front Elevation.

FIG. 2



Section along **U. V.**

Lead Ore Sales.

Dates.	Mines.	Tons.	Price per Ton. £	s.	d.	Purchasers.	
Sept. 30.	Roman Gravels	56¾					
	Minera	100	14	6	0	Walker, Parker, & Co.	
	"	100	14	6	0	ditto	
	"	91	14	6	0	ditto	
	"	100	14	6	0	ditto	
	"	48	14	6	0	ditto	
	"	21½	14	6	6	ditto	
	"	21¼	14	6	6	Brymbo Co.	
	"	8	11	0	0	Walker, Parker, & Co.	
	Bronfloyd	30	14	11	0	Mining Co. of Ireland	
Oct. 1.	Dyliffe	64	13	16	6	A. Eyton	
	"	40	13	14	0	Newton, Keates, & Co.	
" 4.	Great Laxey	100	25	7	6	Treffry's Trustees	
	Macsysafn	70	14	5	0	Brymbo Co.	
	"	70	14	2	6	ditto	
	New Laxey	7½	14	15	0	Sims, Willyams, & Co.	
	"	7½	14	15	0	Walker, Parker, & Co.	
" 7.	Harwood	10	12	12	6	Shield & Dunning	
" 10.	Frongoch	140	13	10	0	Panther Co.	
	East Darren	75	16	10	6	J. & J. Williams	
	Cwm Erfin	25	17	6	6	Treffry's Trustees	
	"	40	17	3	0	Sims, Willyams, & Co.	
" 11.	Wheal Mary Ann	46	27	18	6	ditto	
	"	30	11	4	6	Treffry's Trustees	
" 12.	Twelve Apostles (blue ore)	30	13	15	0	A. Eyton	
	" (white ore)	10	7	0	0	J. Hughes	
" 13.	Talargoch (Maesyrerwddu)	19	14	12	6	Newton, Keates, & Co.	
	" (Coetia Llys)	106¼	15	6	0	ditto	
	Deep Level	20	13	6	6	Walker, Parker, & Co.	
	Brynford Hall	9½	13	0	6	Brymbo Co.	
	South Kilmorey	8½	13	0	0	Walker, Parker, & Co.	
	Rhosesmor	60	13	18	6	A. Eyton	
	"	55	13	17	6	ditto	
	Parry's	21	13	14	0	Walker, Parker, & Co.	
	Bryn Gwiog	45	14	8	0	A. Eyton	
	Long Rake	30	13	12	6	ditto	
	Billins	15	13	16	6	Walker, Parker, & Co.	
	Merllyn	6	12	8	0	Newton, Keates, & Co.	
	North Henblas	15	12	4	0	Walker, Parker, & Co.	
	"	2	12	11	0	ditto	
	Pennant	12½	13	0	0	Brymbo Co.	
	Dog Pit	20	12	14	0	Newton, Keates, & Co.	
	Pwllgwen Llan	21	13	13	6	Walker, Parker, & Co.	
	West Vownâg	25	13	15	6	ditto	
	Llangynog United	42	12	17	6	ditto	
	Llanerchyraur	24¾	13	9	0	ditto	
	Roman Gravels	20	13	7	6	ditto	
	Caeconroy	11¼	14	10	6	Newton, Keates, & Co.	
	Dyfngwm	13	13	2	6	ditto	
	Dyliffe	48	13	11	6	A. Eyton	
	Speedwell	8	12	0	0	Walker, Parker, & Co.	
" 14.	Cargoll	63	18	0	6	—	
	"	19	7	14	0	—	1,303 19 6
	"	2	7	10	6	—	
	"	1	7	1	0	—	
" 20.	Minera Boundary	37½	13	5	0	J. Hughes	
	"	2½	10	5	0	ditto	522 10 0
	Talisker (Australia)	40	11	3	0	Sims, Willyams, & Co.	
	"	86	12	0	0	ditto	1,478 0 0
	Isle of Man Mining Co.	100	25	5	6	Stock & Co.	2,527 10 0
" 24.	East Logylas	70	13	3	0	Panther Co.	920 10 0
	Glogfach	50	16	17	0	Sims, Willyams, & Co.	842 10 0
	Cwmystwith	123	13	6	0	ditto	1,596 0 0
" 25.	Great Laxey	100	25	2	6	J. & J. Williams	2,512 10 0
" 27.	Westminster	40	13	6	6	Walker, Parker, & Co.	533 0 0
	Mount Pleasant	30	13	16	0	Newton, Keates, & Co.	414 0 0
	Hendre Ucha	8	13	10	6	ditto	108 4 0
	Bryngwyn	10	13	17	6	A. Eyton	138 15 0
	Pant-y-Mwyn	14	13	6	6	Walker, Parker, & Co.	186 11 0
	Nant-y-Car	3½	11	0	6	Newton, Keates, & Co.	
	"	2½	6	10	6	ditto	54 18 0
	Dyfngwm	12	13	2	6	Walker, Parker, & Co.	157 10 0
	Llanerchyraur	13	13	10	6	ditto	175 16 6
	Caeconroy	6¼	14	9	6	ditto	90 9 4½

FIG. 1

Section along W. X. Y. Z.

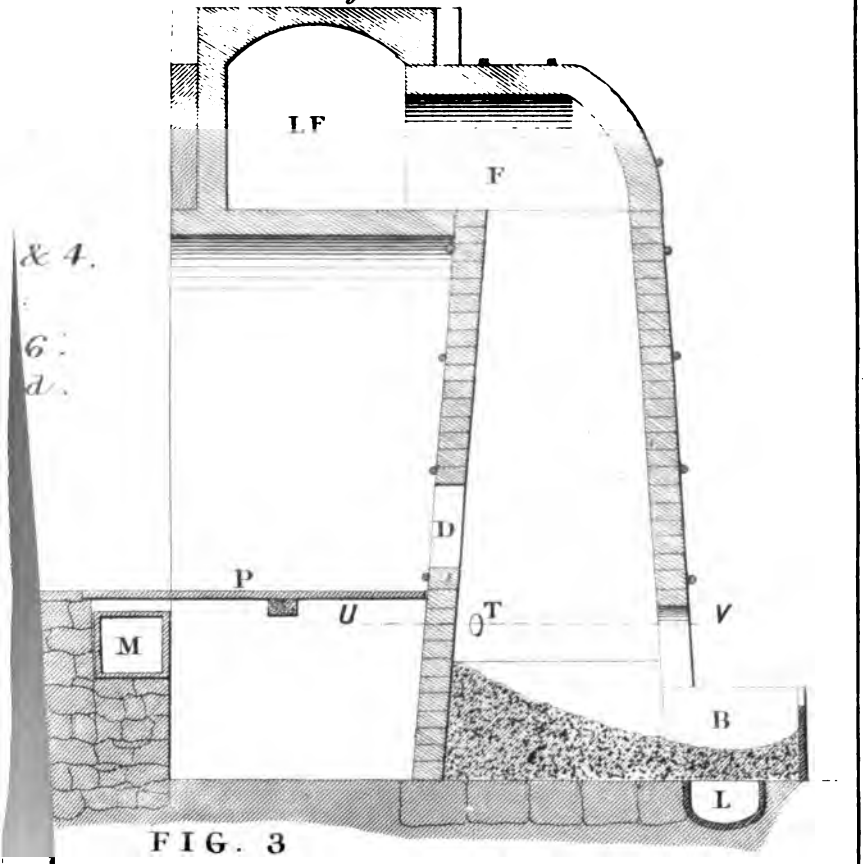
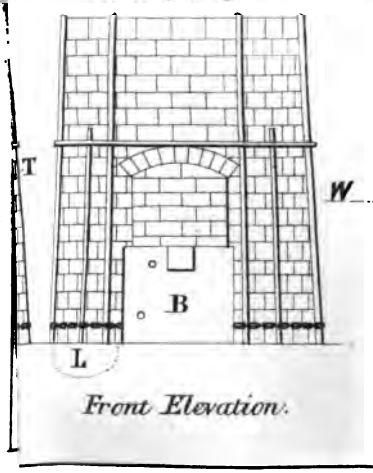
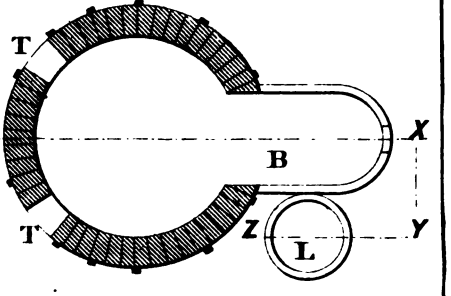


FIG. 3



Front Elevation.

FIG. 2



Section along U. V.

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THE

MINING AND SMELTING MAGAZINE.

DECEMBER, 1864.

Lead Smelting on the Mendips.

By H. Curwen Salmon.

The remarkable surface deposits of lead slag and debris met with on the Mendip Hills have long been known. These hills, which are situated in the north-eastern extremity of Somersetshire and are composed of Mountain (Carboniferous) Limestone, are traversed by numerous lead veins which, judging from the remains found, must have proved very productive in ancient workings, although all modern mining on them has been unsuccessful and is indeed now wholly abandoned. Of these surface lead deposits, three are now working—1. by the Mendip Hills Mining Co., which has one furnace in blast; 2. the Waldegrave Works, owned by Mr. Edward H. Barwell, with one furnace in operation; and 3. the St. Cuthbert Lead works, operating on the Priddy Minery immediately adjoining the Waldegrave works, about 3 miles north of Wells, where there is one furnace at work, and five more in course of active erection. Our object on the present occasion is to describe the operations at the last named works, where, from the number of furnaces building, the operations are proposed to assume an extent and importance never hitherto attempted on the Mendips.

The Priddy Minery deposits, like most of the principal plumbiferous debris localities on the Mendips, are some little distance away from the veins from the working of which the lead ores were originally derived. As is the case in many limestone districts, there is a marked absence of surface streams on these Hills, in consequence of the rainfall being immediately caught in the numerous subterranean fissures and cavities ("swallets") with which the strata is penetrated. Hence the "old men" removed the ores from the mines where they were raised, and concentrated their dressing and smelting operations on the most convenient neighbouring stream. The out-

crop of certain measures occurring above the Priddy Minery deposits, brought a small stream to the surface there, on the banks of, and in the depression originally occupied by, which the debris now supplying the Waldegrave and St. Cuthbert works is accumulated. The area occupied by the St. Cuthbert grant, which is held from the Ecclesiastical Commissioners at $\frac{1}{18}$th dues, is stated to be about 25 acres.

With regard to the extent and value of the deposit occupying this area, we are content to derive the information we give our readers on the present occasion from the reports accompanying the prospectus issued on the starting of the present company in 1862. These reports are from Messrs. D. T. Ansted, F.R.S., Evan Hopkins, F.G.S., Nicholas Ennor, C.E., and J. Arthur Phillips, F.C.S. The most positive of these is the report of Mr. Ennor, who states that "there are 406,560 cubic yards of stuff—worth for lead as it stands £1 per ton—*all exposed to view*," which would give a money value of £500,000 worth of lead *in sight*. Mr. Ansted considers it not unfair or extravagant to assume a content of 500,000 cubic yards, worth £500,000; indeed, he believes that an average yield of 10% is not at all too favourable a view. Mr. Hopkins' estimate agrees exactly with the quantity Mr. Ennor states to be in sight—that is 406,560 cubic yards—which he calculates to contain 600,000 tons, producing from 5% to 10% of lead. Mr. Phillips merely accepts the correctness of the estimate of Messrs. Hopkins and Ennor, and, working thereupon a rule of three sum, arrives at a nett money value of £600,000 for the lead in the deposit, and a nett profit on its treatment of £240,000. But although he declines pledging himself to the exact accuracy of the estimates, Mr. Phillips expresses his full conviction that the property is a very valuable one, from which large profits will be obtained.

This deposit has, like most others on the Mendip Hills, been worked over by Dr. Somers for the "grey slags" which were left by the ancients rather abundantly mixed among the slimes and other debris resulting from their dressing operations. These grey slags contain as much as 20% of lead, while the slimes do not appear to contain more than 5%. Before turned over by Dr. Somers the whole must have shown a very good average, but the present average does not seem to range above 7% to 7½%. The upper part of the deposit is the poorer, often not exceeding a produce of 5%, as from this part the grey slags have been mostly extracted; but the lower part, which was hardly reached by Dr. Somers, and which consequently still contains a considerable proportion of these slags, is much the richer, often averaging as much as 12%. Besides this ancient debris there are also many hundreds of tons of recent black-slag, resulting from Dr. Somers' smelting of the grey slags in the old-fashioned slag-hearth, which contain about 5% of lead, and which are now being worked again by being mixed with the debris in smelting.

Until very recently, and indeed this is still the case to a certain extent, this 7—7½% debris has been dressed, by the usual mechanical operations, up to an average produce of about 45% of lead—some-

times as high as 50°/₀. On this operation it has been found that there is a loss of fully 5°/₀ of lead in the waste—the tailings of the buddles being generally found to contain 3½°/₀, and the skimmings from the hutches 4°/₀. The dressing has been principally effected in a series of round buddles, and, in consequence of the lightness of the work to be treated, has always been a difficult operation. Recently, however, it has been decided to abandon almost all dressing operations, and to put the debris into the smelting furnace directly as it is raised. The only exception will be in the case of portions of the debris containing a large proportion of sandstone, which cannot be dealt with undressed in the furnace.

No doubt this course has been forced upon the company by the great difficulty of carrying out satisfactory dressing operations on a scale adequate to make returns proportionate to their capital. The supply of water is, and has been at all times, limited; and since the decision of the Court of Queen's Bench, in May 1863, in the case of *Hodgkinson* v. *Ennor*,* the difficulties of carrying out any extensive system of dressing must have become seriously augmented, for none of the water used for dressing can now be allowed to escape, but has to be pumped and used over and over again until it evaporates. Hence if the direct smelting of the debris had not been found practicable, it is to be feared that the sanguine hopes held out by the reports on which the company was established could by no possibility have been realised.

The credit of the new arrangements is entirely due to the manager Mr. Hornblower. After some preliminary experiments on a small scale, he made, early in the present year, a trial with 200 tons of debris, of the usual average produce of 7½°/₀. The result of this trial was as follows:—

Time occupied in smelting 200 tons, 3 weeks. This might, however, have been reduced to 15 days if the blast had been sufficient, and the debris had not been so saturated with water as to be generally put in the furnace in a state of mud.

The nett yield was 13 tons of pig lead (or 6½°/₀ lead out of the 7½°/₀ in the debris) and the total cost incurred 123*l.* 2*s.* 6*d.* Taking the lead at 19*l.* per ton, this left a nett profit of 123*l.* 17*s.* 6*d.*, or upwards of 100°/₀.

This result decided the company to proceed at once to the erection of 5 new furnaces, with adequate blowing power and condensing means.

The form of furnace at present in course of erection is shown in Figs. 1, 2, 3, 4, 5 & 6, Plate III. It is a small circular blast-furnace with a shaft 12′ high, having a diameter of 4′ 8″ at the bottom, 4′ 3″ at the twyers, and 3′ at the top; the whole built entirely of fire brick made to the shape required, but only one brick (8″) thick. In front there is an open breast, 3′ 9″ high by 2′ wide, from the lower part of

* For a *precis* of this important case see *Mining and Smelting Mag.*, Vol. IV. p. 39. The Court decided that although the stream passed by subterranean channels from these works to the Plaintiff's paper-mill, yet the latter was entitled to be protected from any polluting matters being thrown into it.

which projects a "breast-pan," 3′ long, 2′ deep, and 2′ wide (B in Figs. 1, 2, & 3) made of cast-iron 1¾″ thick. By the side of this, sunk in the ground, is the lead-pot (L in Figs. 1, 2 & 3) 1′ 7″ in diameter, made of cast-iron 1½″ thick. The charging door (D in Figs. 1 & 4) is at the back of the furnace, commencing 4′ 6″ above the ground, and is 2′ wide by 1′ 10″ high. There are two twyer holes (T T in Figs. 1, 2, & 4) 3′ 3″ above the level of the ground.

At the top of the furnace-shaft is a hooded-flue (F in Figs. 1 & 6) 2′ 6″ high and wide, connected with the main longitudinal flue (L F in Figs. 1 & 6), which latter is shown in Fig. 1 with a section of 3′ 9″ square, but which really varies from 3′ 3″ to 4′ 3″ according as it has to carry away the fume from one or two furnaces. The large transverse flue (T F in Fig. 6), which receives the fume from the whole five furnaces to carry it to the condenser, has a section 5′ wide by 6′ high. These longitudinal and transverse flues are all lined with fire-brick. and supported on arches.

Behind the furnace, 5′ back, a wall is built 4′ high, the interval between which and the back of the house is filled up so as to make a charging house (C H Figs. 1 & 6); and from the wall a charging platform (P Fig. 1) extends to the door of the furnace. On a portion of this wall is to be placed the blast-main (M Fig. 1) which, as we understand it, it is proposed to make 1′ 2″ square, and of wood. The twyers are water-twyers, with nozzles 1¾″ in diameter.

The bottom of the furnace is filled with a compact bed, made up of clay and fine coke ashes well beaten in, of the form shown in Fig. 1—that is 2′ 6″ high at the sides, and gradually sloping down into a hollow in the middle of the breast-pan. When the furnace is working, the breast, above the level of the top of the breast-pan, is built up with fire-brick.

The furnaces and flues are held together by standards, tie-bars, and cramps arranged in the usual manner. The whole of the five new furnaces are under one roof, in a building (shown in Figs. 5 & 6) 89′ long by 34′ wide, immediately behind which is the blowing-engine and condensing apparatus.

The working details of these furnaces are very simple. Before charging, the bottom is strewn with loose coke ashes, through which the globules of lead, separated by the smelting, percolate in passing to the depression in the breast-pan, and thence to the lead pot. During the smelting the breast-pan is also covered with a thick layer of coke ashes. In the old furnace at present working, with the trifling pressure of blast supplied by the blowing fan (scarcely ½ lb. to the sq. inch) from 7 to 8 tons of debris (7-7½% produce) are smelted in a turn of 12 hours, with a consumption of from 20 to 30 cwt. of coke. In the same time about 12 tons of dressed ores (averaging 45%) would be smelted, with probably the same consumption of fuel. In the table of Smelting Costs for the quarter given further on, it will be seen that exactly 2 tons of coke were consumed per ton of pig-lead made, which, taking an average produce of 7½%, would give a consumption of as near as possible 3 cwt. per ton of debris. The breast-pan is cleaned out twice every shift; and the furnace itself is cleaned out every Saturday afternoon, and not

put to work again until Monday morning. During the Sunday a coal fire is kept alight on the hearth to prevent the bottom from cooling. On cleaning out the breast-pan and furnace considerable masses of ferruginous matters are frequently found in the bottom. A small quantity of limestone and a little ironstone is usually added for flux, but the iron in the debris is frequently found sufficient.*

To avoid a serious loss of lead from the chimney, the draft of the furnace has to be kept very dead during the smelting, which sometimes causes the smoke to come back on the workmen. In consequence of the care with which this draft is regulated, the length of the flues (800 yards from the furnace to the stack), &c., Mr. Hornblower seems to be of opinion that there is no serious loss of lead from the chimney, although about *three-quarters* of all the lead produced is volatilised in the blast-furnace and subsequently collected in the flues in the form of soot. Little metallic lead is indeed got directly in the lead-pot: not generally above 2 pigs per shift of 12 hours, when the debris is being smelted.

The furnace at present at work is supplied with blast by a fan making 1,600 revolutions per minute, worked by a 16″ cylinder steam-engine, which is also used for pumping over the dressing water, and drawing up the waggons full of debris. About $\frac{2}{3}$ of the power of this engine may be calculated as being absorbed in blowing, although, from the distance of the fan from the furnace, the result is so very inadequate, giving a pressure of less than $\frac{1}{2}$ lb. per inch.

In consequence of stopping on the Sunday, the furnace only makes about 11 turns (of 12 hours) per week; and as the flues are cleaned out monthly instead of quarterly, it is idle for another 2 days per month. So, on the whole, it does not work more than three-quarters of its full time. In this time however the one at present in work gets through upwards of 300 tons of debris per month, besides running down the rich agglomerated soot. As the lead returns of the last 3 months have averaged about 20 tons of pig, this gives a nett produce for the debris of as near as possible $6\frac{1}{2}$%. Mr. Hornblower gives the produce of the final slags as 1%. Those resulting from the smelting of the dressed ores are of course much richer, containing from 6% to 7% of lead, but these are worked over again and ultimately reduced to 1%.

Where such a large proportion (three-fourths) of the lead is volatilised, the soot collected in the flues is of course the most important matter in the whole working. For the first two-thirds of the distance from the furnace (550 yards) they are found to yield 60% and upwards of lead; and for the last third nearest the stack (250 yards) from 50% to 55%. This soot is run down to metal in the blast-furnace, but before this is done it has to be agglomerated. This is done in an ordinary form of flowing or reverberatory furnace, occupying in time about 8 or 9 shifts. The dressed ores have likewise to be agglomerated before being put into the blast-furnace, and this is done in the same furnace. The agglomerating of both these

* We received no definite information as to the proportion of flux used, which seems to be held as rather a secret.

—the soot or fume and the dressed ores—has hitherto occupied altogether about 12 days per month. This process, and the furnace in which it is conducted, is called "roasting," but no calcining operation really takes place, the only object being to agglomerate the stuff.

The form of blast-furnace described (and which has been called a Castilian furnace) is stated to be of recent origin, and, as we are informed, was gradually brought about by a modification of the old form of blast furnace used for smelting lead in Germany. Such furnaces had generally a deep charge, often as much as 14′, and a rectangular section. Experience seems gradually to have suggested the lightening of the charge, so that the charging door was continually lowered until at present the depth of the charge above the twyers is not more than 18′, the twyers themselves being only 8″ above the side of the bed of the furnace. With richer ores no doubt the charging door would be placed higher up. The adoption of a circular for a rectangular section is an obvious advantage.

One of these small blast-furnaces will last 4 or 5 years, and its first cost is, according to Mr. Hornblower's estimate, only about 30*l.* With the new blowing-apparatus, which it is estimated will give a pressure of 2½ lbs. per square inch, fully 12 tons of debris may be expected to be put through the new furnace per turn, or at least 400 tons per month. With a nett average produce of 6% this will give a yield of 24 tons of pig-lead, per month, per furnace. The new steam-engine is a 30″ cylinder beam engine, working two blast-cylinders of 36″ each. The arrangement of these cylinders is rather peculiar, for they are placed on beams at the *top* of the house (which is consequently very high) one over either end of the beam.

The commercial results of the last half-year's working at St. Cuthbert has been as follows: the money value realised by the lead is given nett, after deducting commissions, discounts, &c.

Returns.

		Tons. c. q. lbs.		£ s. d.
March.	Pig-lead	... 25 3 3 12	at 21/5/0 ...	493 2 9
April.	„	... 25 6 2 25	„ 20/15/0 ...	481 5 6
May.	„	... 20 10 1 1	„ 20/12/6 ...	392 16 6
June.	„	... 19 10 2 2	„ 20/7/6 ...	369 11 9
July.	„	... 21 0 3 13	„ 19/12/6 ...	383 12 3
August.	„	... 18 13 3 13	„ 19/12/6 ...	340 6 2
		130 6 0 10		£2,465 14 11

Expenditure.

		£ s. d.
March.	Cost Sheet.....	273 1 9
April.	„	265 2 3
May.	„	282 15 6
June.	„	265 3 3
July.	„	254 10 0
August.	„	261 5 2
		£1,601 17 11

Showing a cost of 12*l.* 6*s.* per ton of pig-lead made. The nett profit for half-year being 863*l.* 17*s.* on a make of 130 tons, the profit per ton of pig-lead will have been 6*l.* 12*s.* This is of course exclusive of the cost of the new work, but it includes agency which is 25*l.* per month.

No account of the smelting cost proper, as distinguished from that of the raising and dressing of the debris, is kept in the Company's books. We have, however, gone over the books for the quarter March, April, May, and have abstracted from them the results given in the accompanying table—results which we think can be fully relied on. Taking the total cost of 12*l.* 6*s.* given above, and

deducting from this the 5*l.* for smelting, and say 1*l.* for agency there remains 6*l.* 6*s.* as the cost or raising and dressing the 16 tons of debris required to yield 1 ton of metallic lead, which equals 8*s.* per ton of debris.

Smelting Costs Proper for 3 *Months March, April, May*, 1864.

During which period about 71 tons of soft pig-lead were made, from debris yielding an average produce of from 7°/o to 7½°/o (say 7¼°/o).

Labour at Furnaces including about ⅓rds of the Wages of the Engine Men.	Consumption of Coke at Blast Furnaces.	Consumption of Coal at Reverberatory Furnaces (for Agglomerating and Improving).	Consumption of Coal for Blowing Engine, being nearly ⅓rds of total Consumption of Engine.
£ s. d. 140 0 0	Tons. £ s. d. 142 at 14/6 ... 102 19 0	Tons. £ s. d. 47 at 12/10 ... 30 3 0	Tons £ s. d. 90 at 12/10 ... 57 15 0
1 19 5¼	2 ..... 1 9 0	Cwt. qr. 13 1 ..... 0 8 6	Ton. cwt. qrs. 1 1 1¼ ... 0 16 3
Per Ton of Pig Lead.	Per Ton of Pig Lead.	Per Ton of Pig Lead.	Per Ton of Pig Lead.

Summary of Smelting Cost Proper for Quarter.

	Total. £ s. d.		Per Ton of Pig Lead. £ s. d.	
Labour at Furnaces and Blowing Engine.....	140 0 0	...	1 19 5¼	Or 6*s.* 3*d.* per ton of *debris* yielding a nett return of 6¼°/o of lead, taking original produce at 7¼ and allowing 1°/o for loss.
Coke for Blast Furnace	102 19 0	...	1 9 0	
Coal for Reverberatory Furnaces.....	30 3 0	...	0 8 6	
Coal for Blowing Engine.....	57 15 0	...	0 16 3	
Estimated: Wear and Tear, and Sundries: say ...	24 3 0	say	0 6 9¾	
	£355 0 0		£5 0 0	

It is unnecessary to say that with a furnace volatilising three-quarters of the lead produced, the condensation of the fume becomes the vital question. The objection to blast-furnaces in the metallurgy of lead—which has led to their almost entire exclusion in England—is the loss they entail in fume. As we have shown, the lead volatilised by the furnace at present in work at St. Cuthbert's is collected in a long flue assisted by a small condenser of ordinary construction; and the effective collection of this (assuming it to be effectively collected) necessitates all the inconveniences of working with a very dead draft. For the 5 new furnaces, one of Mr. Frederick Bennett's patent condensers has been erected, and will soon be in operation. This apparatus consists in principle of an Archimedean screw, working immersed in a certain depth of water in a cylindrical chamber, through which chamber all the lead fume and smoke pass from the furnace to the stack. In the condenser erected at St. Cuthbert the diameter of the screw is 6′, and it is proposed to work it (by the new engine) at the rate of 300 revolutions per minute. The rapid rotary motion of this screw not only draws in the fume, but at the same time scatters the water so as to bring it into immediate contact with the fume and thus condense it. We have

drawings and a full description of this condenser, which unfortunately we are obliged to postpone until next month. We may say however that on it to a great extent depends the complete success of the large scale of working about to be established at St. Cuthbert's. On the other hand, if Mr. Bennett succeeds here, he will have proved most completely the efficiency of his invention; for, supposing each furnace to pass through 400 tons of debris per month, of 6¼% nett produce, we shall have (supposing three-fourths of the lead to be volatilised) 94 tons of metallic lead to be collected from the 5 furnaces monthly in the form of soot in the condenser. This is certainly no insignificant task for any apparatus to perform in a small compass.

The refining or improving of the lead, which is effected in the ordinary form of reverberatory furnace, calls for no special observation. The lead only contains about three ounces of silver per ton.

This property belonged, within the last few years, to Mr. Nicholas Ennor, and from his hands it passed into those of his son (Mr. Adolphus Ennor) and Mr. James Humby, who sold it to the present company. The pigs are still branded "Ennor, Humby, and Co."

The manager of the works, Mr. Horatio Nelson Hornblower, is a native of the parish of Gwennap in Cornwall, and a member of the well-known family of mechanical engineers. He is an excellent practical lead-smelter, having had a very lengthened experience in Spain, Derbyshire, and elsewhere before he came to the Mendips. His son, who is also employed at the works, has been trained as a lead-smelter in Derbyshire, where he was employed at Messrs. Barker's works at Alport. The blowing engine and air cylinders at present in course of erection are being put up under the superintendence of Mr. W. H. Gray, of Roche, near St. Austell.

Results of the Recent Working of Rachette's Furnace.*

Iron Smelting.

In No. 75 of the *Berg Geist* there appeared an anonymous article on this subject by a writer who professed to take an impartial view of the relative advantages and disadvantages of this form of furnace. He commences by stating that there is scarcely any subject in iron smelting upon which such diverse opinions have been expressed as Rachette's furnace. Besides the conflicting opinions which usually arise respecting any important novelty, in this case the most contradictory statements of facts have reached the public in consequence of the notorious differences between the constructor of the furnace and the company. Under these circumstances an unprejudiced *critique* upon the results hitherto obtained at the Mülheim furnace may not be uninteresting. Some only of the most important points

* For particulars as to the form and construction of Rachette's furnace, see *Mining and Smelting Magazine*, Vol. V. p. 193, *et seq.*

can be referred to, as no sufficiently accurate *data* as to the Mülheim works can be obtained.

The most essential advantages which were anticipated from this new construction of furnace were a small cost of erection, a high production, and a saving in fuel. Of these expectations the first has been fully realised, for the cost of erection is considerably less than for any other form of furnace, only reaching to from ½ to ⅔ of that of an ordinary coke blast-furnace. As regards the production, in the middle of June it was stated to be from 30,000 to 35,000 lbs. of white pig. This is no great production at the present day when many blast-furnaces produce 60,000 lbs. and upwards, which renders the advantage of the less cost of construction very doubtful. Lastly, the consumption of coke, with a charge containing 35% of iron, is stated at 1·30 lb. per lb. of iron. But if it is reckoned according to the proportion of each charge of coke to each charge of ore, the result is 1·52, which is about correct, and is therefore not more favourable than the results obtained at other furnaces working under similar conditions. Besides, the consumption of coke as it is usually expressed, that is, proportionately to the iron produced, is essentially contingent on the percentage of the charge, and therefore does not enable us to form an opinion at sight on the success of the operation. If it is desired to compare the consumption of fuel for charges of varying percentages, it will be necessary to consider the charge as a whole. On this principle the following are the results of working for white pig at some of the well-known ironworks:—

Concordia Works	0·37 lbs. of coke to one of charge.
Blast-furnace at Mühlhofen . .	0·34 „ „ „ „
Steele Furnaces	0·28 „ „ „ „
Rachette's Furnace	0·42 „ „ „ „

But although the results of the Rachette furnace have not hitherto been more favourable than those obtained at other furnaces, it would still be rash to assume its unsuitability from such a limited experience. This construction of furnace undoubtedly offers considerable advantages; among others a larger smelting capacity and a very judicious distribution of the blast—two of the most important requisites in blast-furnace working. In fact the advance which has been made of late years in the production of blast-furnaces may be traced to the enlargement of the hearth, and the corresponding increase in the quantity of blast supplied. The following comparison of various furnaces shows the influence of these two elements—an influence which has, indeed, been long acknowledged by metallurgists:—

	Production.	Section of the hearth at the twyers.	Supply of blast.
Sayner Furnaces ...	15,000 lbs. of grey pig	... 3·8 sq. feet	... 830 cubic feet.
Concordia Works ...	20,000 „ white pig	... 4·8 „ „	... 980 „ „
Mühlhofen Furnace	45,000 „ „	„ ... 12·6 „ „	... 2,700 „ „
Steele „	70,000 to 80,000 „ „	„ ... 28·3 „ „	... 3,400 „ „
Rachette's „	30,000 to 35,000 „ „	„ ... 27.5 „ „	... 2,300 „ „

It must be remarked that in all these cases hot blast is used, the temperatures of which are for the sake of comparison, reduced to the uniform one of 0° cent. (32° Fahr.).

But although it may be stated as a fact that the production of a furnace increases with the supply of blast and with the enlargement of the hearth, still this latter has evidently its limits. The greater the diameter of the hearth the more difficult it is to distribute the blast equally, so as to bring it into the centre; a greater number of twyers are necessary, and the pressure of the blast must be increased; and this is where the advantages of the Rachette furnace are most clearly felt. It possesses a large smelting-space which is uniformly supplied with blast in consequence of the number of twyers, without requiring a high pressure from the narrowness of the hearth. As regards the section of the hearth, the Rachette furnace is nearly equal to the Steele furnace, while, as far as the supply of blast and the production are concerned, it is far behind the Mühlhofen furnace. It is a question whether, if the supply of blast were increased in the Rachette furnace, the production might not also be considerably increased. To effect this it would only be necessary to enlarge the section of the twyers, without increasing the pressure of the blast which is already more than sufficient.

The writer concludes by observing that it may be presumed that Rachette's furnace has not, so far, nearly approached its maximum production, and that it will require longer experience and many trials before this is attained.

As has been the case with many other professedly impartial critics, the writer in No. 75 of the *Berg Geist* seems to have found favour with neither party. He certainly found none with Herr Aubel, who made a lengthened rejoinder in a subsequent number of the same journal, in which he stated that although the data published as to the Rachette furnace had, in consequence of the misunderstandings between the constructor of the furnace and the company, been contradictory and uncertain, the whole impartiality of the writer seems to be confined to believing neither side, and even substituting imaginary results. Thus while the daily production during the early period of the working was repeatedly stated to be 42,000 lbs. of grey pig, and later on was given by the company as 50,000 lbs. of white and 35,000 lbs. of grey, the writer in No. 75 takes the production at from 30,000 to 35,000 lbs. of white pig. He also assumes an arbitrary estimate of the fuel consumed, but this assumption, as will be shown further on, was not even accurately made use of in his calculations. Altogether not only does he arrive at fallacious conclusions founded on incorrect data, but even his mode of inferenee will be proved to be often erroneous, as could not well be otherwise considering that he neglects many highly important facts. Not only is he silent as to the quality and density of the coke, the utilising of the waste gases (for heating the blast, and boilers), the apparatus for drawing off the waste gas, and the pressure of the blast, but also as to the fusibility and reducibility of the ores, the different cubic

capacities of the furnaces, the percentage of the charge, and the temperature of the heated blast.

To begin with, therefore, the writer is met by the objection that he does not in the least take into consideration the varying properties of the ores smelted in the localities referred to (and the fluxes required), but simply assumes that the furnaces chosen for comparison work under like conditions, that is with charges of the same quality. Now in considering the character of the materials that may be worked in a furnace so as to get a high production with an economy of fuel, it is not enough to ascertain the quantity and quality of the coke and fluxes required, the percentage of the burden in iron and manganese, or the quantity of slag-forming constituents, but attention must also be given to the different degrees of oxidation in which the metals occur, and the combinations of these with carbonic and silicic acids, as also to the nature and proportions of the earthy matters occurring in the ores. A full consideration of these facts enables us to understand the chemical composition, the degree of silication, and in fact the whole character of the resulting slags; and enables the metallurgist to give an approximately correct opinion as to the greater or less fusibility of the ores, and consequently the production that can be attained and the fuel required. In order accurately to bring these conditions under consideration the following are among the data required:—

1. The specific heat of the various metallic oxides and earthy metals;

2. The latent heat absorbed by the various materials of the charge in changing their condition of aggregation;

3. The quantity of heat requisite to give rise to chemical composition and decomposition;

4. The reducibility of the ores, which depends on:
   - *a.* Their physical nature,
   - *b.* The time required,
   - *c.* The temperature, and
   - *d.* The pressure of the reducing gases passing through the furnace; and

5. The exact temperature at which the various qualities of pig-iron melt and the different degrees of silication of the slags.

Meanwhile there is a sufficient number of facts to show that the comparison of the two kinds of furnace given by the writer in No. 75, is not only incomplete but perfectly inaccurate. Thus, for example, in peroxide of iron the oxygen has far less affinity for the iron than in protoxide, therefore the former will be first reduced by carbonic oxide gas with the formation of carbonic acid, while the protoxide requires a higher temperature and the presence of solid carbon. But those combinations of silicic acid with per- and protoxide of iron, which melt before the reduction takes place, and consequently are reduced exclusively at the expense of the solid coke, are still more unfavourable for the results, particularly as regards the consumption of fuel. These not only give rise to a very considerable loss of fuel—as each atom of protoxide of iron takes up an atom of carbon—but a very inferior final product is obtained,

since phosphorus, sulphur, silicon, and perhaps other earthy metals are taken up. If this kind of retarded reduction takes place at the expense of the graphite already in the pig-iron, the latter will be doubly decarburised, inasmuch as, with the increase of silicon in the iron, the carbon is decreased by oxidation, and the result is a white, dull, impure product, poor in carbon. According to Boulanger and Dulait, pig-iron resulting from the reduction of such silicates, requires 78% more carbon than that resulting from the reduction of peroxide of iron by carbonic oxide. This has been found to be the case at Mülheim, and the inferiority of the ores from Elfe has been publicly discussed and fully proved by the opinions of practical men, so that I shall only give the general opinion in the words of Herr S. at H. "The magnetic ironstone of Nassau is very unsuitable for smelting, and furnishes a most inferior bar-iron * * * * the ores from Cyriax Mine increase the cost of production by 6 thalers (about 18*s.*) per 1,000 lbs. of pig-iron, so that even in adding only $\frac{1}{8}$ of these the cost is increased by 1 thaler (about 3*s.*)."

In all blast-furnaces there is a normal time, varying with the nature of the ores smelted, for the charge to remain in the furnace, and the extension or the converse of this interval has an unfavourable effect both as regards the production and the consumption of fuel. Thus, for example, at the older furnaces of the Wissenerhütte, where spathic and brown ironstone of good quality is smelted, very good results have been obtained with a change of charge every 12 hours; while at the Nivernerhütte, in smelting very difficultly fusible red hematite from Nassau, 36 hours are required, and if this period were shortened to 28 hours a larger consumption of coke would be necessary.

If, for instance, in one and the same furnace, and during a similar space of time, the ores of the Nivernerhütte were first smelted and then those of the Wissenerhütte, in the first case only a third of the production would be obtained, although the percentage of the charge would be nearly the same. From this it is evident that in comparing the production and the consumption of fuel at two different furnaces the cubic capacity of the furnace must be first considered and then the section between the twyers. It is also obvious how absurd it is to estimate the cost of erecting a furnace (which depends on its cubic capacity) from its production; unless indeed it were possible to find two furnaces exactly alike, and working under precisely similar conditions in every respect, as the writer in No. 75 certainly assumes of four!

Again, in the table which professes to explain the ratio of the production of the furnace to that of the section between the twyers, the figures attributed to the Rachette furnace are incorrect by 7·5 square feet, and besides that nothing is said about the percentage of the various charges, in which however a few percents. more or less make a great difference in a comparison as to the consumption of fuel.

According to Boulanger and Dulait the quantity of coke required to make 100 kilo of pig iron varies (according to the quality of the the make) with the percentage of the ores in the ratio shown below:

	25	30	35	40	45	50 % of iron in ore
Per 100 kilo refinery pig	169	131	102	83	67	54 kilo of coke
„ foundry „	223	164	128	103	83	66 „ „ „

The notion that the advantages of the Rachette furnace are best evidenced by the circumstance that in the old form of furnace the greater the diameter of the hearth the greater pressure of blast required, is similarly incorrect. This merely depends upon the resistance of the body of the charge; for it has been proved by practical experience that the space of combustion, that is the focus of the nozzles of an iron-blast furnace, gains a proportionately very slight extension by any increase in the pressure of the blast, in the temperature, or in the section of the nozzles.

Although the quantity of blast supplied to a furnace may be more accurately estimated by taking the consumption of coke in a certain unit of time than by the ordinary method of taking the pressure and the section of the nozzles, yet to do this it does not merely suffice to reduçe the blast to O° cent. (32° Fahr.). Thus, for example, while the apparatus for heating the blast at Mülheim can only raise it to 150° cent. (300° Fahr.), at the Steele works the blast is heated to about 300° cent. (572° Fahr.). If we assume the same quantity of blast as the writer in No. 75 the difference of 150° in the temperature would give the Steele furnace 510,255 units of heat per hour more, corresponding to about 75 lbs. of coke. As in this latter furnace 3,200 lbs. of pig-iron are produced per hour on an average, the consumption of coke per 1,000 lbs. of pig-iron will be decreased by about 23·5 lbs., including the quantity of heat which would result from the combustion of this 75 lbs. of coke to carbonic acid; but if we reduce this in the same manner as it really takes place in the blast-furnace to carbonic acid and carbonic oxide gas, the consumption of coke per 1,000 lbs. of pig-iron will be reduced by about 36 lbs.

Thus it is only possible to compare two smelting processes, when the ratio between the carbonic acid and the carbonic oxide has been determined by the analysis of the waste gases. For it is only by such an analysis that the quantity of oxygen in the charge itself as well as the quantity that is brought in with the blast, and consequently the true volume of the carbonic acid and carbonic oxide gases, can be ascertained.

In comparing furnaces with respect to their consumption of fuel and capacity of production, it is absolutely necessary to take into consideration the percentage of the charge, and this quite independent of any considerations as to the nature of the ores to be smelted, for these, as we have seen, require very varying intervals for their passage through the furnace so as to furnish pig-iron with the smallest consumption of fuel. Now although the writer in No. 75 does not give the ratio between the iron made and the coke consumed, but between the coke and the whole quantity of the charge, yet the figure (·42 lbs.) which he gives for the Rachette furnace must be reduced to ·30 or ·35 lbs. Even accepting his own figures of 1·30 or 1·52 lbs. of coke for 1 lb. of iron, these, when we take into consideration the addition of 50% of limestone, become reduced to $\frac{35 \times 1{\cdot}3}{100 + 50} = {\cdot}30$, or $\frac{35 \times 1{\cdot}52}{100 + 50} = {\cdot}35$—results which most nearly approximate to the Steele and Mühlhofen furnaces.

A much better comparison—but still, as will be seen from what has gone before, only an approximately correct one—as regards the consumption of fuel, is the quantity of slag resulting with a definite yield of pig-iron. At Mülheim, where the percentage of the charge is at most 35%, requiring at least 50% of limestone, 3,286 lbs. of slag are obtained per 1,000 lbs. of pig-iron; while at Mühlhofen, where the charge contains about 43%, requiring 40% of limestone, only 2,256 lbs. of slag are obtained per 1,000 lbs. of pig. This greater formation of slag in the Rachette furnace, 1,030 lbs. more per 1,000 lbs. of pig, requires at a temperature of 2,000° cent. (3,630° Fahr.):

$0{\cdot}2 \times 2{,}000 \times 1{,}030 = 412{,}000$ units of heat, which corresponds to 90·6 lbs. of coke.

The consumption of coke of 1·30 to 1·52 lbs. per 1lb. of iron, or on an average 1,410 lbs. of coke per 1,000 lbs. of white pig, assigned to the Rachette furnace by the writer in No 75, must, if these figures are correct, be reduced by the following quantities:—

1. As the charge contains about 15% of iron in the form of silicates about 164·97 lbs. must be deducted;

2. As the quantity of slag per 1,000 lbs of iron is 1,030 lbs. more, about 90·6 lbs. must be deducted; and

3. As the temperature of the blast is 150° cent. (300° Fahr.) less, about 36 lbs. must be deducted, or a total of 291·57 lbs. Consequently the consumption of coke at the Rachette furnace would be reduced to 1,118·43 lbs. of refinery pig, supposing the furnace to be working under the same conditions as those which prevail at other works.

Thus I have shown the difficulties that have to be contended with in comparing two given furnaces, and at the same time I have proved how insufficiently this hitherto unsolved problem has been answered by the writer in No. 75.

As, up to the present time, no information as to the primary advantages of the Rachette furnace has been laid before the public, and thus an undue importance has been attributed to its secondary advantages, it seems now necessary to give some account of matters which have not hitherto been made known. This will shortly be done.

LEAD SMELTING.

The general results of the experiment of smelting the galena of the Upper Harz in Rachette's furnace at the Altenauer works, up to within a short time of its being blown out, have been already given in this MAGAZINE, Vol. VI. p. 144. Now that the furnace, after working nearly seven weeks has been blown out we are enabled to give a more complete account of the results obtained, which we abstract from an editorial article in No. 42 of the *Berg-und Hüttenmännische Zeitung*.

As was before stated, the furnace, after being properly heated, was charged, on the afternoon of the 28th of June, with 67 measures of charcoal, each of 10 cubic feet, and when that had burned down a little, 62½ centners of slag from the first fusion of the [illegible] (Bleistenschlacken) were added in small quantities at a time. On

the following morning the blast was turned on with a pressure of 4″ of quicksilver, and the furnace charged with coke and materials, the latter consisting per turn of 36 centners of schlich, 4 centners of iron, ½ centner of skimmings, 1 centner of lead scraps, 175 centners of regulus-slag, and 20 centners of schlich-slag. From 120 to 150 lbs. of charge were added to 30 lbs. of coke, and charged in such a manner that the former was placed at the long sides and the latter in the middle of the furnace. As soon as the charges went down regularly, without a flaming of the throat and without any perceptible quantity of soot forming, the pressure of the blast was raised first to 6″ then to from 8″ to 9″, the pressure being ascertained by 5 manometers.

During the first few days the operation went on with perfect regularity as far as the quality of the product was concerned; indeed the slag formed was even less impure and poorer in lead than with the ordinary method of furnace working. On the other hand the quantity of pig-lead and regulus formed in the front fore-hearths was greater and the flow of slag more active than in the back hearth, which might, however, have arisen from the fore-hearth of the old schlich-furnace having been situated on that spot, and consequently the ground there being more thoroughly dried than at the back. This drawback, which was also accompanied by the formation of projections on the sole of the back hearth, was prevented from having any injurious effect by frequent cleaning.

After three days, however, a new difficulty arose, for the sandstone below the twyers began to shell off, and the nozzles, deprived of their support, were then burnt away by the melting masses. As long as it was possible, this was attempted to be remedied by stamping in damp clay, injecting water, &c., but ultimately the twyers had to be continually renewed as they were burnt away, thus interrupting the working by having to shut off the blast, which reduced the temperature. The forming of a nose, by increasing the burden, immediately caused an irregular sinking of the charges, so that to prevent this, the twyers had to be kept bright. Sometimes it was found possible to charge from 280 to 350 lbs. of materials to 30 lbs. of coke, but any attempt to increase this proportion, was followed by a large formation of projections in the hearth. On the second day, notwithstanding the frequent change of twyers, the production rose to double that of an ordinary schlich-furnace, and during the following fortnight to three times that amount; when, in trying to raise it still further, by increasing the proportion of the charge, the working became obstructed by projections in the hearth. After the removal of these the furnace remained for some time in a satisfactory condition by changing the twyers in proper time, but the hearth became more and more enlarged, and at the end of about five weeks considerable projections had formed at some of the twyers, the removal of which could not be effected without great difficulty. The fore-hearths in particular had extended so much, that on the 38th day it was necessary to renew them, an operation which occupied about 6 hours, during which time the furnace was at a standstill. On turning on the blast again, the five twyers on one side continued to remain dark,

and it was only after a great deal of trouble and charging a large quantity of basic slags that after about 30 hours two twyers again became bright, the foci of which brought the other twyers into activity. The hearth, however, on one side was already so much burnt away that the charges only passed down regularly for a short time. Considering this and as the row of twyers on one side were quite dead, notwithstanding a pressure of blast of 10″ of quicksilver, and as two twyers of the other side were becoming dark and thoroughly choked, it was resolved to blow out the furnace, it having then been in work nearly 7 weeks. The furnace did not commence to flame until the charge had sunk down 4 feet.

When blown out the furnace was found to be unaltered down to within 3 or 4 feet of the twyers, where on one side projections were met with, while on the other side part of the hearth was burnt away even to the outer wall. During the seven weeks' working, 137 new twyers had been put in, and only 6 centners of soot had formed.

In the following approximate comparison of the results of smelting in Rachette's furnace with those of an ordinary schlich-furnace, the results obtained from the somewhat normal working during the first 38 days only are referred to, up to the time when the fore-hearths had to be renewed, as in the following seven days the condition of working was too abnormal to allow of any accurate comparison.

In 38 days, with a charge containing 60 lbs. of lead, and 10½ quentche* of silver per centner there were run out:—

	Rachette Furnace.	Schlich Furnace.
132 charges of 36 centners each	4,752 ctrs.	2,749½ ctrs.
Iron	574 „	305½ „
Skimmings	66 „	38½ „
Lead Scraps	132 „	76½ „
Regulus-slag	5,567½ „	2,100 „
Schlich-slag	890 „	1,145 „
	11,981½ ctrs.	6,414½ ctrs.
Daily Productions in pig lead	62 ctrs.	33⅓ ctrs.
„ „ „ regulus	56·5 „	31 „
Production of pig-lead per charge	18·71 „	16·62 „
„ „ regulus „	17·05 „	15·41 „
Percentage of Ag. in the pig lead	16 quentche	16 quentche
„ „ „ regulus	6 „	6 „
„ „ lead „ „	18 pfd.	22 pfd.
„ „ Ag. in the slag	0·093 quentche	0·125 quentche
„ „ lead „ „	2·39 pfd.	2·9 pfd.
Quantity of soot per charge of schlich	0·045 ctrs.	1·0 ctrs.
Percentage of Ag. in the soot	5 quentche	7·5 quentche
„ „ lead „ „	41 pfd.	47 pfd.
1 pfd. of fuel smelted	7·06 „ of charge	6·33 „ of charge

According to this the Rachette furnace has the following advantages over the schlich-furnace:—

* A *quentche* = $\frac{1}{16}$ of a *loth*, or (in round numbers) about $\frac{1}{32}$ of an ounce. Therefore any given number of quentche to the *centner* = (in round numbers) about the same number of ounces to the ton.

1. A production of about 2·36% more lead is obtained in consequence of the formation of less soot, poorer regulus, and poorer slag;

2. The production both of pig and regulus is almost double;

3. A small saving in fuel is effected, which, like the production, would have been much greater if such frequent interruptions had not occurred consequent on the putting in of new twyers. For short periods during the normal working 1 lb. of coke would have smelted 11 lbs. of charge, or 4 lbs. more than in the ordinary schlich-furnace.

The disadvantages of the Rachette furnace are stated to be:

1. A larger staff, there being required one workman more than at two ordinary schlich-furnaces.

2. The great destruction of twyers, the cost of which, however, is more than compensated by the larger production in lead. Thus 137 twyers at 27 ngr. 3 pf. (about 2*s.* 8*d.* each) is 121 thlrs. 10 ngr. (about 18*l.* 4*s.*). Taking the lead at 6 thlrs. (18*s.*) per ctr. there results from 4,750 ctrs. of schlich smelted a gain of 2·36 $\frac{4750}{100}$ 6=612 thlrs. (91*l.* 16*s.*). Deducting from this the cost of the twyers consumed, 121 thlrs. 10 ngr. (about 18*l.* 4*s.*), there remains a clear profit of 490 thlrs. 20 ngr. (about 73*l.* 12*s.*), or 3 thlrs. 26 ngr. 8·1 pf. (about 1*l.* 0*s.* 7*d.*) per charge.

In erecting a furnace for a fresh experiment it is intended to procure more refractory materials than was possible in the first one, as well as to provide suitable apparatus for cooling both the furnace and the twyers. There will be also an advantage in having an experienced staff, predisposed in favour of the furnace.

This experiment has been conducted entirely under the management of Oberhüttenmeister Beermann, and in it he has fully maintained his reputation as a theoretical and practical metallurgist.

A Contemporary Rock-formation, or Slag Conglomerate.

By A. Cordella, Royal Greek Mining Engineer, Athens.*

The formation of the various rocks that diversify the surface of the earth having taken place, for the most part, beyond the scope of our observation, from being of aqueous origin, it may not be uninteresting to give a notice of a rock which has been formed within the historical period, and still continues to be formed on some points of the Mediterranean coast.

On several points of the south and east coast of Attica, between

* Berg- und Hütten. Zeit., No. 35, 1864.

Cape Sunium and Portoraphti, large slag-heaps are found piled on cliffs of primitive granular white limestone, the remains from the smelting of the argentiferous lead-ore of Laurion, worked during the time of Pericles. This district, so important to the miner and metallurgist, is composed of mica-schist and granular limestone. The mica-schist is fine grained, of a greyish-white or brownish colour, with nodules of quartz, and dips, with undulations, at an angle of from 25° to 40° towards the N.E. Wherever this mica-schist crops out, in the valleys, ravines, and along the coast, but more especially at Bromopuss, it is intersected by numerous veins of brown iron stone and galena, varying from 1 to 10 centimetres (·4″ to 4″) wide. Above the mica-schist the primitive fine-grained limestone is usually deposited with a thickness of from 50 to 150 metres (about 160′ to 500′). In this limestone, certain beds, ranging from 20 to 40 centimetres (8″ to 16″) thick, are met with, consisting sometimes of spathic iron-stone (as at Theriko), and sometimes of manganiferous brown iron-stone, with stones of galena (as at Spelasesa); or containing, in a ferruginous limestone, fluor spar, iron spar, calc spar, brown spar, quartz and galena, as at Beladuri and Cape Sunium. The general regularity of this limestone deposit is disturbed, near Theriko and Rou (Ergastirakia) by intrusions of greenstone.

From this short description it will be understood that the boulders ordinarily found on the sea-shore consist of mica-schist, quartz, limestone, greenstone, iron-spar, and brown iron-stone. But bordering the sea along the foot of the slag heaps there is found, especially at Puntasesa, Pascha, Rou, Cyprianos and Orysakia, a peculiar formation of a slag-conglomerate, which is spread all round about the heaps, and which, at some points even extends as far as 40 metres (about 130′) into the sea. The fragments of this slag—ranging in size from that of a cubic centimetre (·06 cub. inches) to that of a cubic decimetre (61½ cubic inches)—which have fallen down into the sea; and which, in consequence of the imperfect smelting processes of the ancient Greeks, are found to contain granular particles of argentiferous lead, from the smallest size to that of a cubic centimetre (·06 cubic inches), as well as, at times, unsmelted fragments of cupriferous galena; are all found to have become rounded, or even converted into the finest sand by the action of the waves during many centuries.

The finest of the slag debris (slag-sand) formed becomes mixed with granular particles of quartz, mica, limestone, spathic-iron, and greenstone, as also with the separated-out particles of argentiferous lead, and the remains of the various shells of species living in those waters. These form, with the calcareous clay mud, and the sea-algæ—*Cystoseira* and other species—a cementing medium, by which the larger fragments of slag that have become rounded by the action of the sea are thoroughly united together, and thus form the remarkable slag-conglomerate in question. By the formation of this recent rock it is also found that the coast line is gradually being advanced seaward, which can be clearly seen at low water. This conglomerate not only contains shells—such as *Patela, Greca, Spondilus, Monodonda, Trochus, Columbella*, etc.,—but also shells of

landsnails, bones, pieces of wood and pottery, etc., which have been washed by the rain from the cliffs into the sea in the neighbourhood of the slag.

Sometimes, for instance at Rou, the conglomerate has become so intimately mixed with fragments of quartz, and become so hard as well as so thick, that the inhabitants of the Wlachian village of Keratea make millstones of it, having a diameter of from 30 to 45 centimetres (12″ to 18″), and also small handmills for grinding corn, or any other ordinary household purpose. It is highly interesting to notice in the formation of the conglomerate, the simultaneous washing out of the lead by a natural "dressing" process. Thus, after the slag has been disintegrated and pulverised by the action of the waves and currents, the particles of lead contained in it become separated out, and, from their greater specific gravity, become deposited immediately on the coast, while the pulverised slag (slag-slime) is partly carried away and partly remains as a cementing medium.

With a calm sea and clear water, these particles of lead may be seen, covered with a greyish-white coating of chloride of lead, filling up the small cavities in the beach, shining out from the green and blue ground of the slag-conglomerate; an effect which, at times, is rendered still more striking by the particles of lead remaining in the larger fragments of slag also standing out brightly from the surface. At such points I have frequently collected more than 2lbs weight of thoroughly-dressed argentiferous lead.

This rock-forming process is a purely mechanical one. The disintegrating and pulverising of these fragments of slag, which may be considered as basic calcareo-silicates, is not due to the gradual decomposition of the surface; for I have, so far, nowhere been able to discover any decomposition in the lead slags of Attica, but have found them to be simply acted on mechanically by the waves and currents. The facts connected with this conglomerate may therefore be so far of interest to the geologist, that they may assist to throw light on the conditions under which various other conglomerates have been formed in earlier geological times. Since the time of Pericles and Themistocles, when smelting operations here were in the height of their activity, a period of 2,380 years has elapsed; or since they ceased at the end of the Peloponnesian war a period of 2,350 years. During this historically geological period, not only have fragments of slag the size of the fist been converted into the finest sand (sea-slime) by the action of the waves, but the land on the coast of Attica has been added to to the extent of several hundred square metres, with a thickness of half a metre (20″).

Abstracts and Reviews.

METALLIC MINES COMMISSION.

As will have been seen by the synopsis we gave in our last number, (see *ante*, p. 274) the Commissioners arrange their Report under the

heads of the various leading metallic-mining districts of Great Britain. In laying a summary of it before our readers we shall find it more convenient to arrange the matter under the heads of the leading topics discussed.

Health of Miners.

As a general proposition, the health of copper, tin, and lead miners, as a class, is greatly inferior to that of agricultural labourers, and others employed in the open air. Miners show at a comparatively early age signs of debilitated constitutions; their faces are sallow, they have an anxious expression of countenance, and their bodies are thin. At the border of middle age health begins to fail, and they rapidly acquire the feebleness of declining years, and become unfit for laborious work when their experience and skill would otherwise make them most valuable workmen. According to the Report, it is a common remark in Cornwall that a "person of fifty is old for a miner." The first symptoms of failing health are weakness in climbing ladders and beating the borer—shortness of breathing, giddiness, pains in the head, and failing appetite. These symptoms are followed by a harassing cough with much expectoration, tightness of the chest, and general failure of strength; affections which precede a total disability to work and are followed by premature death. The delicate condition of the miner is more strikingly evidenced when contrasted with the appearance of vigorous health generally presented by the women and children in the same districts.

The Commissioners much regret that the attention of the medical men connected with mines has not been specially turned to the causes and nature of the "miners' disease," by examining the air of the localities in which the men work, and endeavouring to get an insight into the disease by *post mortem* examination. In excuse of the latter it is alleged that the prejudices of the relatives of the deceased miners are too strong to be overcome; but from want of such sufficient investigation hasty and often erroneous returns as to the cause of death have been made to the district registrars. Indeed the disease peculiar to miners has been commonly registered as "consumption," and hence supposed to be identical with phthisis, or tubercular pulmonary consumption; althoug it is now proved that, notwithstanding that some miners do die of consumption (mostly those who have an hereditary taint), by far the largest amount of mortality is due to forms of lung disease of a bronchitic or asthmatic character.

The mining districts of Cornwall and Devonshire were visited by Dr. Peacock and Mr. Bankart. Dr. Peacock examined 83 miners, labouring under different forms of disease, and above 500 who were still at work; and Mr. Bankart reported on 150 ailing or disabled miners. These gentlemen agree in representing the sanitary condition of the miner as very defective, and in considering that the men are worn out by their labour earlier than is usual with persons following equally laborious occupations in the open air. The diseases they met with were chiefly asthmatic affections, resulting from bronchitis, pneumonia, and disease of the heart, and more rarely to tubercular consumption. Rheumatic disorders and various dyspeptic symptoms are also common. They attribute these unhealthy conditions to several causes—

1. The early age at which miners commence working underground;

2. The severity of labour they undergo in climbing ladders in deep mines;

3. To working in a heated atmosphere and in draughty places; but, above all, to

4. The impurity of the air which they breathe underground.

Exposure to damp and cold at the surface, they also consider to be an exciting form of disease; and the early period at which miners begin to work underground also materially conduces to their premature decay. Dr. Peacock shows, in his report, that of the men he examined 39 per cent. went to work at from 10 to 13 years of age, and 48 per cent before the age of 14.*

In the Yorkshire and Northern districts Dr. Peacock examined 25 men suffering from disease and 225 men at work at Alston, Nenthead, Allenhead, Weardale, and Middleton in Teesdale. By far the largest number of cases of disease were miners' asthma. The miners in these districts generally attribute the impairment of their health to bad air, powder reek, and "stour." With regard to the latter, which is the miners' term for the dust of the mines, it is considered by many to be worse than anything else; and in this respect Dr. Peacock thinks that the mines in these districts are more injurious to health than those of Cornwall. As the mines are shallow, the climbing of ladders cannot be considered as injurious; and although the diseases met with here correspond generally with those observed in Cornwall, the miners' asthma is usually a simpler form of disease than in Cornwall, and less frequently complicated with disorganisations of the lungs or diseases of the heart. On the whole, in comparing these districts with Cornwall, the appearance of the miners is more robust, and there is a larger proportion of middle-aged and old men amongst them; which may be attributed to the comparatively short period in each week during which the men work at the mines, the ready access without having to climb ladders to any extent, and the more natural temperature of the workings.

Dr. Peacock also visited the mines in the neighbourhood of Mold, Flintshire, and the general opinion he formed was that the miners of that district are by no means a robust race. He found them suffering under the same forms of disease as the miners of Cornwall and the North of England, referable to the same causes.

Lastly, Dr. Peacock visited the Hematite iron miners of the district of Furness, in Lancashire, whom he found a robust race, as healthy as other men engaged in equally laborious occupations. This he attributes to the mines being better ventilated; to the men not commencing to work underground till they have attained full vigour; and to their living on a more nutritious diet, particularly to their taking more fresh animal food.

Vital Statistics.

From the returns prepared by the Registrar-General, and from the evidence given by Dr. Farr, F.R.S., of the Statistical Department of the General Register Office, the Commissioners have been enabled to give statements showing the rates of mortality prevailing among

* Mr. W. Tayler, surgeon, of Tywardreath, writes to the *West Briton;* "I see from the report of the Mines Commission it had been advised that no boy under under fourteen years of age should work underground. Without questioning the humanity or the wisdom of this decision, I may venture to draw your attention to the very curious and interesting fact that those miners who have attained the greatest longevity, residing in Tywardreath, St. Blazey, and other places which have come under my immediate observation, commenced their subterranean labours at the age of ten or twelve years. Of course, in different localities different statistics might be adduced; but I merely give the result of twenty-seven years' experience, having been for a long period one of the surgeons to Fowey Consols, Par Consols, as well as Union Surgeon to the St. Blazey district; and, I may truly add, have paid great attention to the subject of miners' diseases."

the metallic miners of Cornwall, of Yorkshire and the Northern Counties, and of Wales and Shropshire, compared with those prevailing among the non-mining males of the same districts. In order to ascertain whether the excessive mortality among metallic miners was or was not a necessary condition of the miner's occupation, caused by mere working underground in the dark, an examination was instituted by Dr. Farr of the rates of mortality prevailing among the coal miners of Northumberland and Durham, the results of which are also embodied.

These statements are given in the Report in tabular form under the heads of the various districts. Collating these tables we have the following results as to the rates of mortality from *all causes* during the five years 1849-53 inclusive, among (1) the Cornish metallic miners, (2) the Northern coal miners, and (3) the non-mining males of the Cornish districts, for the several decennial periods of life from 15 up to 75 years. The districts selected in Cornwall for the purposes of comparison were those of Liskeard, St. Austell, Truro, Helston, Redruth and Penzance.

Average Annual Number of Deaths per 1,000 Cornish Metal Miners and per 1,000 Northern Coal Miners, and per 1,000 Males exclusive of Miners (in the Cornish Mining Districts mentioned) from *all causes* during the five years 1849-53 inclusive.

Ages.	Cornish Metal Miners.	Northern Coal Miners.	Males exclusive of Miners.
15 — 25	8·90	8·50	7·12
25 — 35	8.96	8·49	8·84
35 — 45	14·30	10·13	9·99
45 — 55	33·51	16·81	14·76
55 — 65	63·17	24·43	24·12
65 — 75	111·23	65·16	58·61

From these figures it would appear that the rates of mortality among miners do not differ materially from those prevailing among the non-mining males of the same districts until after the age of 35 years, from which period there is a large and progressive excess of mortality among miners. That this excess of mortality among miners between the ages of 35 and 65 years must be due to unwholesome conditions incident to their occupation may be inferred from the fact that it does not commence until these conditions have had full time to operate. The somewhat higher rates between the ages of 15 and 25 years probably arise from many boys being put to work at too early an age. A comparison between the Cornish miners and the Northern colliers shows that the rates of mortality among the former from the age of 35 years upwards are nearly as much in excess of the rates that prevail among the colliers as they are above those of the non-mining male population of Cornwall.

A similar examination of the more recent triennial period, 1860-62, extended to the mining districts of the North and to Wales as well as

Cornwall, gives the following results. The same districts of Cornwall are taken; but inasmuch as the number of miners in some of the Northern counties was too small taken separately to justify general deductions as between their health and that of the non-mining sections of the population, the death-rates given in the tables are computed from the aggregate number of the deaths of males of the two classes respectively in all the lead mining districts of Northumberland, Durham, Cumberland, Westmoreland, Yorkshire, and Lancashire. With regard to Wales and Shropshire the statistics have reference only to the district of Holywell.

Average Annual Number of Deaths per 1,000 Miners and per 1,000 Males exclusive of Miners, in the Cornish Mining Districts mentioned, and per 1,000 Miners and per 1,000 Males exclusive of Miners in the six counties named and per 1,000 Lead Miners and per 1,000 Males exclusive of Lead Miners in the Holywell District from *all causes* during the three years 1860-62 inclusive.

Ages.	Cornwall and Devon.		Yorkshire and Northern Counties.		Wales and Shropshire.	
	Metal Miners.	Males exclusive of Miners.	Metal Miners.	Males exclusive of Miners.	Lead Miners.	Males exclusive of Lead Miners.
15—25	9·44	7·50	9·53	7·57	6·04	7·46
25—35	9·57	8·32	12·38	9·19	15·72	10·52
35—45	15·12	10·08	17·64	10·13	18·05	12·57
45—55	29·74	12·50	33·11	16·18	25·74	15·19
55—65	63·21	19·96	78·34	29·38	55·19	28·11
65—75	110·51	53·31	127·52	66·10	86·96	75·78

With regard to Cornwall this period of three years gives about the same result as the earlier period of five years. With regard to the Northern counties the table shows that at all ages from 15 years upwards the miners die in somewhat larger proportions than the non-mining population, and also that this excess of mortality increases largely and progressively with increasing age up to that period of life after which few miners continue to work underground. With regard to the Holywell district the excess of mortality among miners compared with other sections of the population is much less striking than in Cornwall and the Northern counties; but the table still indicates that the lead miners of this district suffer from causes of disease and premature death from which the rest of the male population is exempt.

With respect to the special causes of the excessive mortality among miners, Dr. Farr's inquiries, supplemented by the Registrar General's returns, show that it is mainly caused by the large number of deaths from pulmonary diseases, including phthisis, laryngitis, bronchitis, pleurisy, pneumonia, asthma, and all cases returned as diseases of the lungs. The following table shows the comparative rate of mortality from these diseases among miners and males exclusive of miners in the districts already mentioned for the three years 1860-62.

Average Annual Number of Deaths per 1,000 Miners and per 1,000 Males exclusive of Miners, in the Cornish Mining Districts mentioned, and per 1,000 Miners and per 1,000 Males exclusive of Miners in the six counties named, and per 1,000 Lead Miners and per 1,000 Males exclusive of Lead Miners in the Holywell District from *Pulmonary Diseases* during the three years 1860-62 inclusive.

Ages.	Cornwall and Devon.		Yorkshire and Northern Counties.		Wales and Shropshire.	
	Metal Miners.	Males exclusive of Metal Miners.	Metal Miners.	Males exclusive of Metal Miners.	Lead Miners.	Males exclusive of Lead Miners.
15—25	3·77	3·30	3·40	3·97	3·02	3·39
25—35	4·15	3·83	6·40	5·15	4·19	5·79
35—45	7·89	4·24	11·76	3·52	10·62	5·41
45—55	19·75	4·34	23·18	5·21	14·71	7·06
55—65	43·29	5·19	41·47	7·22	35·32	12·21
65—75	45·04	10·48	53·69	17·44	48·31	16·96

From this it is evident that pulmonary diseases are the chief cause of the excess of mortality among metallic miners. That these diseases are due to conditions incident to the miner's labour is made evident from the fact that this excess of mortality does not begin until the age of 25 years, when the conditions contingent on working in mines have had sufficient time to exercise a sensible influence on the health; and does not reach its acme until after the middle of life, when these conditions have had full time to undermine the constitution. The much greater discrepancy between the rates of mortality among miners and non-miners from pulmonary diseases as compared with that between the respective rates of mortality from all causes is undoubtedly due to the fact that exposure to the peculiar conditions attendant on their occupation causes many miners to die of pulmonary diseases who in different circumstances would have died of other complaints. Hence the great excess of deaths from pulmonary diseases does not in the same proportion raise the general rate of mortality, although as has been seen, it does so to a very large extent. Between Cornwall and the Northern Counties there is no great distinction to be made although the proportions are slightly different for different decennial periods. In the Holywell district the excess of mortality from pulmonary diseases, like that from all causes, is much less striking than in Cornwall and the Northern Counties.

(To be continued.)

STRIKES IN THE COAL DISTRICTS.

Lord Lyttelton has addressed the following letter to the *Times* newspaper:—

"During the recent strike of the colliers in South Staffordshire I

happened to remark, at a meeting of the South Staffordshire Adult Education Association, that some of the coalowners in the district attributed the evil of strikes to education among the working people, and were disposed in consequence to withdraw their aid from educational movements.

"As this observation has attracted more notice than I had expected, and has been partly doubted and partly misunderstood, I shall be glad to be allowed, now that the strike is over, to say a little more on the subject

"I never meant it to be understood universally of the employers in the district. No one could think of applying it to Lord Dudley or Mr. Foster, or Messrs. Chance, or Messrs. Bagnall, or Mr. Lloyd, or the British Iron Company, or others who might be named. Nor did I say it of the coalowners as a class; but I say it is true of several of them.

"I will give no names; but I can answer for the following having been said, and not on any merely private occasion, by some or other of the coalowners during the strike:—

"'That they disapproved night-schools; that the more a man was educated the worse workman he was; that they should for the future decline to assist the working classes in any way; that education and the —— penny papers had done all the mischief, and that public-houses were the proper place for working men to meet in; that they should leave the working classes to themselves for the future; that the more was done for the working classes the more ungrateful they were; that if education went much further there would soon be no colliers to be had, and that the utmost a working-man should know was to read his Bible; that education had filled the men's heads with all kinds of nonsense; and that the best educated men misled the others.'

"I do not want to argue these points. In the general opinion of the country, as I conceive, they are beyond the region of argument. I would, however, say a word on the question of practicability.

"These gentlemen are not speaking of education in the sense of moral training or discipline; they mean instruction or information. Now that the information of the working-men is very defective no one doubts, and there is some truth in the opinion that it had better be either more or less. These gentlemen wish it less. My belief is, that if it were less—suppose as it was thirty or forty years ago—the then state of things would recur—quite as many strikes as now, in addition to outrages and disturbances which we are now free from. The recent strike was the worst we have had for twenty years, and there was some fear of serious disturbance; but nothing happened like what used to be a matter of course.

"This, however, is not the point. No one *can*, in these days, diminish the amount of information diffused among the labourers. We may regulate or we may pervert it; we may cause it to be accompanied or unaccompanied by moral training and religious knowledge; but backwards towards mere ignorance we shall not go. They will get informatinn,—*si possunt, rectè; si non, quocunque modo.*

"Nor can they remain stationary. It follows that we should endeavour to increase and improve their knowledge. On this obvious truth I shall not dwell, only observing on a single point, that if the employers of labour here would but endeavour to get some acquaintance with the rudiments of political economy, of the laws that determine wages, into the heads of their men, they would, by that alone, do a good deal towards preventing any danger of the recurrence of these mischievous disturbances.

"My main object, however, is to adduce a few positive facts with which I have been furnished as counter-evidence to the statements above recited.

"The incumbent of one of the largest parishes in the district, full of colliers, tells me that only three of his parishioners took a leading part in the strike; that one of them was almost a professed infidel, and all three of them about fifty years old, and consequently uninfluenced in early life by our recent systems of education; that not one of the *elder* scholars of his schools joined the strike, and that the colliers, furnishing fewer boys to the schools than any other class, those boys, too, leaving school earlier than others, are the worst educated class among his people.

"I have been favoured with a communication from an Inspector of Schools, acquainted with this district and with the cotton district. It is true that much must be attributed to the general advantage possessed by the latter in the regulative system of the Factory Acts, which apply to other things besides education, and some adaptation of which I hope is in store for this district. But the comparison, as relates to school education, is instructive.

"I need not say that in the factory districts strikes and disagreements are far rarer than in the coal districts, and with regard to education these brief statistics seem nearly conclusive. Out of 500 worsted and woollen workers in the Halifax district night-schools, 95 per cent. could at least read easy narrative, full 70 per cent. could write from dictation. In the South Staffordshire night-schools 50 per cent. of the collier boys could not read easy narrative, between 30 and 40 per cent. of the iron-work boys could not read the New Testament.

"There is another view of this subject. The collier population generally have some grievances. Much will be found about them in a volume called *Transactions of the Association of Coal, Lime, and Ironstone Miners*, published at Leeds in November, 1863 (Longmans), of which an abstract and review will be found in the *Spectator* of the 6th of August last. They are chiefly such as these—the demoralising employments still allowed to women; imperfect ventilation and imperfect inspection of the pits; want of proper provision for security; and employment of boys too young and too ill-educated. It is certain that the better the men are educated the more these grievances will be felt. But if any employers, consciously or unconsciously, make *this* an objection to education, they will assuredly meet with small sympathy in the country.

"I may, perhaps, add, that I write with no prejudice against the masters connected with this strike; for, as a mere question of wages, though I have no practical acquaintance with the subject which could enable me to speak confidently, my belief is that the masters were right, and almost always have been right.

"All these things, be they matters of fact or matters of opinion, have the best chance of coming to good if they are exposed to the action of public opinion."

Extracts, Notes, and Memoranda.

MINING AND QUARRYING.

GALIBERT'S RESPIRATORY APPARATUS.—This apparatus, one object of which is to enable any portion of a mine, where the ventilation may

have been suspended or where there is an influx of foul air, to be penetrated without danger, consists of the following simple parts. (1) A mouth-piece of wood, of the form and size of the human mouth; (2) two vulcanised india-rubber tubes, of suitable length, attached to this mouth-piece; and (3) a nose-piece to prevent the gas entering by that organ. When the mouth and nose-pieces are fixed on the face, the apparatus is worked simply by the operator closing alternately with the end of his tongue, the hole corresponding to one or the other of the tubes. During the inspiration he closes one, after which he quickly carries his tongue to the other which he closes during expiration. A very short practice enables this action of the tongue to be effected with ease and regularity, so that the air is inspired by one tube and expired by the other. When it is only necessary to penetrate a short distance, it is merely necessary to have the pipes of sufficient length that their ends may be in respirable air; but if a long distance has to be traversed amidst bad air, it becomes necessary for the operation to take a supply with him. For this purpose M. Galibert employs a reservoir made of goat-skin with a capacity of about 10 or 12 gallons, fixed on the back by straps and waist belt. The upper part of this reservoir is in communication with the aspiring pipe, and the lower part with the inspiring pipe—so that the vitiated air coming from the lungs may mix as little as possible with the inspired air. This reservoir is kept pliant by being constantly wetted or kept filled with water. It is obvious that this system is distinguishable from any other proposed by its extreme simplicity, and by using the same mass of air—the 10 or 12 gallons supply of which will suffice a man for 15 or 20 minutes. The apparatus costs from 3*l.* to 3*l.* 10*s.*, including the goat-skin.

Safety Apparatus for Mine Cages.—For this purpose M. N. I. Lebrun of Brussels, fixes down the whole length of the shaft two vertical wrought iron bars, opposite each other and at a convenient distance, the inner surfaces of which are serrated so as to form two ratchet racks. Between these bars there is a mechanism so arranged that if the rope breaks the cage becomes locked in the teeth of the ratchet racks.

A New Reducer and Amalgamator.—Among recent Californian inventions is an amalgamator by Mr. Leclerc which consists of an upright cylindrical tub, about 4′ high and 18″ in diameter, within which are placed, in a perpendicular shaft and at short intervals, six grinding surfaces, each with its own set of mullers, forming, in fact, a series of six small amalgamators, placed one over the other. The ore is fed in at the top, and passes down by the force of its gravity through and between the grinding surfaces. The amalgamation and concentration take place at the bottom of the tub, through which an upward stream of water is made to enter; the discharge of gangue being effected at a height of several inches from the bottom.

Blake's Stone-Breaking Machine.—At the meeting of the Institution of Mechanical Engineers, at Birmingham, a discussion took place on the merits of this machine, when Mr. Lancaster stated that with the use of one for breaking limestone and ore at the Kirkless Hall Ironworks (see *Mining and Smelting Magazine*, Vol. V. p. 159) 3*d.* per ton covered all the expenses of breaking, but did not include carting the stone away, nor any charge for interest on capital or depreciation. Mr. Wilson Lloyd did not see, that being the case, how a saving could be effected by the machine as compared with hand labour, because at their own works, at Wednesbury, limestone was broken by hand labour

for 3¼*d.* per ton, to 3″ cubes. Mr. Lancaster said that the larger size of the pieces broken by hand labour would make a great difference in the expense of breaking, for the cost of breaking stone by hand labour to so small a size as 1½″ was many times greater than in reducing it to 3″ only.

A NEW BLASTING POWDER.—At the annual meeting of the members of the Royal Institution of Cornwall, held at Truro on November 22nd, Mr. Robert Were Fox referred to a new gunpowder invented by a German medical gentleman named Echrhardt, who thought that it would supersede the ordinary gunpowder for blasting in mines. Dr. Echrhardt produced two powders which when kept separate were perfectly harmless, but when mixed their explosive power is said to be greater than that of gun cotton.

AN IMPROVED QUARTZ CRUSHER.—This machine, which is a Californian invention, consists of a central iron beam, 2′ in length, to each end of which is attached by a pivot bolt a square faced hammer with a curved iron handle. This beam, set in motion by a wheel and belt, brings the force of these hammers alternately in contact with a post, curved so as to allow them just to pass in the circle formed by the revolution of the beam, till they arrive at that point where their own weight causes them to fall upon a die with a force said to be sufficient to crush the hardest rocks. These hammers make 80 revolutions per minute, within a circular iron covered frame, 30″ in diameter, to which a hopper is attached; each hammer weighs 45 lbs., the face of each being 3″ by 5″. It is stated that with this machine an engine of 1 H.P. can crush 5 tons of rock during an ordinary day's work.

METALLURGY AND CHEMICAL MANUFACTURES.

SLAG OF BLAST-FURNACES.—Although practical men have always been able to form a more or less correct estimate of the working of a blast-furnace from the nature of the slag, M. Mène considers that the latter has not yet been sufficiently thoroughly studied by chemists; in which opinion, however, our readers will remember Dr. Percy by no means coincides. Following up his investigations in this branch of metallurgical chemistry, M. Mène has recently arrived at the following conclusions.—(1) That slags have always a perfectly definite chemical composition, since the figures given by analyses can always be arranged into regular formulæ. (2) Since experience has shown that the best working of a blast-furnace required to make white pig-iron, is that which allows of an excess of lime in the bed of fusion, we may take its normal formula as SiO^3, Al^2, O^3, SiO^3, 4 CaO, corresponding to an average composition of 38% of silica, 20% of Alumina, and 42% of lime. (3) Wherever M. Mène has adopted a basic slag the yield of the furnaces has increased without the getting of any accidental products in the regular working. Black vitreous slags are avoided. This, no doubt, necessitates rather a high temperature, estimated 2,000° Cent. (3,600° Fahr.) in order to fuse there basic slags; and the bed of fusion besides requires to be carefully made by frequent analyses of the coke, ores, &c.

MANUFACTURE OF ALUMINIUM.—M. N. Basset, of Paris, states that the metalloids and metals which by double decomposition will form chlorides more fusible and more volatile than the chlorides of aluminium may be employed for reducing these latter. Thus arsenic, boron, cyanogen, zinc, antimony, mercury, and even tin, may be used,

and also the amalgams of zinc, antimony, and tin; but M. Basset prefers to use zinc, owing to its low price, its facility of application, its volatility, and other useful properties. The zinc should be added in the proportion of about four of zinc to one of chloride of aluminium. When this latter is brought into the presence of zinc at a temperature of from 250° to 300° Cent. (482° to 572° Fahr.), a chloride of zinc and free aluminium is obtained. This latter will dissolve in the excess of zinc, and the chloride of zinc combining with the chloride of sodium, the mass becomes thick or pasty, and then solid, while the alloy of zinc and aluminium remains liquid. If the temperature of the mass is again raised it all becomes liquid again, the zinc reduces another proportion of chloride, and the excess of zinc becomes enriched with an additional quantity of aluminium. The rich alloy is again melted with the addition of more chloride of aluminium, and kept well stirred, until nearly pure aluminium, with only a small percentage of zinc, is obtained. This is again melted at a nearly white heat, until the remaining zinc is volatilised, and pure aluminium remains.

Moulds for Casting Metals.—Mr. H. Cochrane, of Ormesby Iron Works, Middlesborough, proposes to construct permanent moulds for casting iron and other metals that shall not act injuriously on the casting by chilling the surfaces and engendering gases. The moulds are made of a composition of fire-clay, black lead, and plumbago, sometimes the plumbago being replaced by silicon.

Obtaining Oil from Coal.—Mr. J. P. Raeburn suggests for this purpose the use of cylindrical retorts having a circular or reciprocating motion, and in the sides or ends of which apertures with doors are constructed, for the purpose of introducing the substances to be treated. The end of the retort has pipes inserted into it, which branch off in any convenient direction to condensers where the products of the operation are ultimately collected.

Treating Gold and Silver Ores.—Messrs. Crosby and Thompson, of Colorado, California, propose some improvements in roasting and treating ores of gold and silver which consist in the application of a perforated hollow axle, for the purpose of furnishing a sufficient supply of air at all points in the length of the burning cylinder; of a gas chamber, with an inclined plane, for separating the burned solids from the gaseous and vaporous products, without admitting external air so as to vitiate the draught; of a condenser, for condensing the metallic vapours and obtaining a hot dilute solution of acid to aid amalgamation; of a blower, for making an inward draught with the cylinder, gas chamber, and condenser, so that no metallic vapours may escape before condensation; and of grinders, made of some soft wood, or of any soft material suitable for grinding burnt ores, and removing any coatings there may be on the gold particles.

Cooling Puddling Furnaces by Currents of Air.—Messrs. Taylor, Molineux, and Harrison propose to construct puddling furnaces in such a manner that by means of air chambers the use of any "fettling" material will in a great measure be dispensed with, and the inventors believe that by this furnace the iron produced will be purer, and will cost less than by the present method. The furnace is of the usual form except that on each side of the puddling door an air chamber is constructed, and these chambers are carried round the furnace in such a manner that they both meet at the rear of the furnace, the air from both the chambers being discharged into the chimney. Thus two currents of cold air will be continually drawn in at the two mouths of

the air chambers, and by constantly passing round the furnace will have the effect of cooling it. The workman also will be in a great measure protected from the noxious gases arising from the puddling of the iron to which he is now subject, as these gases will have a tendency on escaping from the furnace door to be drawn up one or other of the air chambers.

HARDENING CAST-IRON.—In order to harden the surface of castings, when the piece is filed up it is brought to a red heat and then immersed, until quite cold, in a solution composed of 2½ lbs. of sulphuric acid, 1,000 grs (½ of a lb.) of nitric acid, and 9 quarts of water. It is stated that the iron is sufficiently hardened for all ordinary purposes and does not suffer any distortion.

MISCELLANEA.

INSTITUTION OF MECHANICAL ENGINEERS.—A general meeting of members of this Institute was held at Birmingham on Nov. 3rd. Among the papers read was one by Mr. T. Levick, of Blaina Ironworks, giving a description of a coal-cutting machine, invented by Mr. J. G. Jones of Blaina, in which the axis of the pick is carried in a revolving headstock, so that the pick can be worked in any plane, or at any inclination. The advantages of the machine are stated to be the saving of a large percentage of small coal during the process of cutting, with a corresponding increase in the proportion of large coal got, while the cost of getting is diminished; the ventilation is also improved. Another paper was one by Mr. H. Bennett, on puddling iron by machinery. Mr. Bennett's mechanical puddler has been already described in this MAGAZINE (see Vol. V. p. 92) but we may add that Mr. Bennett states that with the puddler at work at the Wombridge Ironworks, the consumption of coal in the double furnace, with a charge of 10 cwts., is only 17 cwts. per ton of puddled bar, as compared with 28 cwts. per ton in the single furnace, with a charge of 5 cwts. In the single furnace the machine works six heats of 5 cwts. each per turn of from 9 to 10 hours, and in the double furnaces five heats of 10 cwts. each.

NORTH of ENGLAND INSTITUTE OF MINING ENGINEERS.—A general meeting of members of this Institute was held at Newcastle on Nov. 5th, Mr. N. Wood in the chair. In the discussion on Mr. Isaac Bell's paper on the manufacture of iron in connection with the Durham and Northumberland Coal-field, Mr. Bell stated that 30 new furnaces are in course of erection, two of them, erecting by Messrs. Bell Brothers, being 80′ high and 20′ in diameter, or somewhat larger than those of Messrs. Bolckow and Vaughan, who were the first to build furnaces of an unusual size. Mr. Bell was not, however, in a position to say anything as to the results.

MANCHESTER GEOLOGICAL SOCIETY.—The annual meeting of members of this society was held on Nov. 3rd, when the following officers were elected for the ensuing year: President, Mr. Andrew Knowles; honorary secretaries, Messrs. J. E. Forbes, and G. Greenwell; honorary curators, Messrs. E. W. Binney and H. M. Drinerod. The accounts showed a balance in hand of £76.

It is with deep regret that we have to announce the melancholy death, at the age of forty-six, of Mr. William James Dunsford, who shot himself in an access of temporary delirium, on November 9th.

Mr. Dunsford had been for some years largely connected with the London mining market, and of recent years had been the secretary and London agent of a large number of mines in Cornwall, Wales, and elsewhere. At the time of his death there were forty-seven mines in his office, among which may be mentioned Wheal Trelawny, West Caradon, North Downs, Holmbush, Wheal Grylls, Wheal Arthur, East Vor, and Wheal Uny in Cornwall, Bryn Gwiog and Long Rake in Wales, Dale Mine in Staffordshire, and the Quebrada Land and Mining among foreign mines.

We have also to announce the death, at the age of eighty, of Mr. Stephen Davey, of the firm of Stephen and Richard Davey, of Redruth, Cornwall, the elder brother of Mr. Richard Davey, M.P. for the western division of that county, which took place on November 16th. Mr. Davey occupied a prominent position in the Cornish mining interest for the last fifty years. He was the son of Captain William Davey, who was the manager of the Consolidated Mines when they were first started by the late Mr. John Taylor in 1819; and, associated with his brother and to some extent with the Messrs. Williams of Scorrier, he was connected for many years with the working of numerous mines in Cornwall, the most important of which were Old Wheal Tolgus, East Wheal Rose, and Wheal Buller—the two latter mines being among the most splendid successes met with in Cornwall during the present century.

Bibliography.

BLAKE, W. P.—Notes on the Geology and Mines of Nevada Territory (Washoe Silver Region, U.S.)—Quarterly Journ. G.S.

BREITHAUPT, H.—Haspelleistung in der Sierra del Cabo de Gata in der spanischen Provinz Almeria. (The effectiveness of the windlass in use in the Sierra del Cabo de Gata.)—Berg. -und Hütten. Zeit., No. 36.

This paper contains a description of a peculiar form of windlass used at the Respings mine, which is worked by 4 men, and which not only draws the workmen twice up and down a shaft 40 fms. deep but brings up about 8 tons of stuff during the 12 hours.

GEYER, R.—Die Blei -und Silbererz-Aufbereitungsanstalt "Silberau" bei Bad Ems. (The Establishment for Dressing Lead and Silver Ores at Silberau near Bad Ems.)—Berg. -und Hütten. Zeit., No. 44.

This extensive establishment is situated on the river Lahn, and at it are dressed the ores of two neighbouring mines. These ores contain galena, blende, carbonate of lead, copper and sulphur pyrites, besides spathic iron, quartz, and clayslate.

NEUENDAHL, L. VON.—Die Königliche Friedrichs Grube bei Tarnowitz. (The government mine Frederick at Tarnowitz.)—Berg. -und Hütten. Zeit., No. 43.

A short description of the lead mining operations at Tarnowitz in Galicia carried on by the Austrian Government.

SCHELL, F.—Die Unglücksfälle in den Oberharzischen Bergwerken. (The accidents in the mines of the Upper Harz.)—Berg. -und Hütten. Zeit., No. 43.

The author has compiled an account of the most remarkable accidents that occurred during the first half of the present century, giving an exact description of the situation and the means employed in rescuing.

STADLER.—Gewinnung von Cadmium at Engis in Belgien. (Obtaining Cadmium at Engis in Belgium.)—Erdm. J. f. pr. Chem., B. 91, S. 359.

This cadmium is obtained from roasting blende which contains from 13—24% Cd, the cadmium is deposited at the mouth of the retorts as soot.

STOLBA.—Löthrohrreaktionen. (Reactions with the blowpipe.) Erdm. J., Bd. 90, S. 460.

ULRICH, G.—Mineralogisches, Geognostisches, und Metallurgisches aus den Goldfeldern Südaustraliens. (Mineralogical, Geognostical, and Metallurgical Remarks on the Gold-Fields of South Australia.)—Berg. -und Hütten. Zeit. No. 42.

The writer, who is on the Australian Geological Survey, gives some interesting accounts of the mining and metallurgical processes connected with gold mining in Australia.

Patents relating to Mining and Metallurgy.

(Compiled from Commissioners of Patents' Journal.—Subject matter only given.)

UNITED KINGDOM.

APPLICATION FOR PATENTS FROM OCT. 13TH TO NOV. 21ST.

2,525 (1864). J. WATSON, Manufacture of hydro-carbons.

2,526 (1864). R. A. BROOMAN (com. from A. BAUDESSON and P. HOUZEAN), Manufacture of prussiates of ammonia.

2,566 (1864). W. E. NEWTON (com. from T. H. WALTON), Safety fuses for blasting.

2,581 (1864). W. TAYLOR, H. HARRISON, and G. BROWN, Manufacture of iron.

2,607 (1864). A. REYNOLDS, Manufacturing sulphuric acid.

2,612 (1864). G. E. DONISTHORPE, Getting coal and other minerals.

2,613 (1864). J. G. JONES, Machinery for getting coal and other minerals.

2,634 (1864). W. CLARK (com. from E. A. COTELLE), Concentrating and distilling sulphuric and other acids.

2,639 (1864). R. A. BROOMAN (com. from A. DE BERGUE), Improvements in blast and other furnaces.

2,650 (1864). B. F. BRUNEL, Treating titanic iron sands.

2,673 (1864). W. CORMACK, Obtaining hydro-carbons.

2,707 (1864). G. ASHCROFT, Pressing fuel and peat and crushing mineral substances.

2,714 (1864). E. L. S. BENZON (com. from A. LOHAGE), Casting steel.

2,733 (1864). F. YATES, Manufacture of steel and malleable cast-iron.

2,758 (1864). J. M. and J. STANLEY, blowing cupolas and blast-furnaces.

2,772 (1864). A. BECHEM and H. WEDEKIND, Rolling metals.

2,776 (1864). A. MOREAU (com. from DON FRANCISCO MARQUES MILLAN DEL REAL), Extracting silver from lead.

2,816 (1864). D. S. SUTHERLAND, Compressing gunpowder for blasting.

2,839 (1864). J. FIRTH, Manufacture of steel and iron.

2,841 (1864). T. E. VICKERS, Manufacture of steel castings.

2,852 (1864). A. WALL, Combinations of materials for fuel.

2,856 (1864). S. C. KREBFT (com. from J. BOZZA), Manufacture of iron and steel.

2,876 (1864). A. G. HUNTER, Manufacture of soda and potash.

2,884 (1864). M. HENRY (com. from P. HUGON), Apparatus for carbonising wood.

2,904 (1864). J. GRIFFITHS, Manufacture of iron and steel.

2,914 (1864). P. E. GAY, Excavating and cutting rock and stone.

2,920 (1864). G. M. DE BAYELT and J. E. VIGOULÉTE, Agglomerating artificial fuel.

2,929 (1864). P. HAGGIE and P. GLEDHILL, Machinery for getting coal, stone, and minerals.

PATENTS SEALED FROM OCT. 20TH TO NOV. 24TH.

1,019 (1864). J. E. DUYCK, Distilling and purifying petroleum oils and other hydro-carbons.

1,036 (1864). H. Bennett, Machinery for puddling iron.
1,083 (1864). W. C. Cambridge, Manufacture of iron.
1,172 (1864). H. Aitken, Mode of calcining and extracting the oil and gases from ironstone.
1,114 (1864). E. H. Newby (com. from A. L. Fleury), Manufacture of iron and steel.
1,656 (1864). S. Fox, Treating slags to obtain cast-steel.
1,193 (1864). W. Weild, Casting ingots from metal prepared by Bessemer's process.
1,196 (1864). T. M. Gisborne, Kilns for burning limestone and ores.
1,185 (1864). M. Morgans, Improvements in blast-furnaces.
1,244 (1864). G. Hunter, Apparatus for cutting slate and coal.
1,262 (1864). T. Dunlevie and J. Jones, Improvements in metallic alloys.
1,349 (1864). J. Young, Treatment of bituminous substances.
1,366 (1864). O. E. Prieger, Manufacture of ferro-manganese and cupro-manganese, and the combinations or alloys thereof with other metals.
1,506 (1864). P. Spence and H. D. Pochin, Smelting copper ore.
1,296 (1864). B. Jones, Obtaining sulphur from alkali or blue waste.
1,714 (1864). J. W. Horsfall, Manufacture of peat, coal, or fuel.
1,842 (1864). D. Barker, Manufacture of artificial fuel.
1,375 (1864). F. O. Ward, Treatment of alkaliferous minerals to obtain alkalies, alkaline salts, alumina, and accessory products.
2,126 (1864). J. Lones, Coating iron with steel.
1,315 (1864). J. Eastwood, Machinery for puddling iron and steel iron.
1,352 (1864). W. and S. Firth, Machinery for cutting coal, stone, or other minerals.
1,401 (1864). J. Napier, Separating certain metals and metallic substances from ores, etc.

Patents on which duty has been paid from Oct. 13th. to Nov. 19th.

2,637 (1861). R. Mushet, A certain metallic alloy. [50*l.*]
2,614 (1857). C. C. Alger, Furnace for smelting iron. [100*l.*]
2,744 (1861). R. Mushet, Manufacture of cast-steel or homogeneous iron. [50*l.*]
2,669 (1861). E. Chambers, Hydraulic power for crushing quartz. [50*l.*]
390 (1858). D. R. and G. Nurse, Coating metals. [100*l.*]
2,810 (1861). A. B. Bérard, Separating metals from their ores. [50*l.*]

Patents Void by non-payment of duty from Oct. 15th. to Nov. 19th.

2,605 (1861). H. Macmeikan (com. from R. V. Rodda), Smelting copper gold, and other ores.
2,607 (1861). J. Webster, Manufacturing oxygen gas.
2,623 (1861). J. T. Smith, Collecting the inflammable gases evolved from blast-furnaces.
2,643 (1861). G. H. Birkbeck (com. from J. F. de la Batie), Separating silver from lead.
2,664 (1861). J. Chesterman, Heating steel and iron, and hardening and tempering steel.
2,735 (1861). G. Holcroft, Blast-furnaces for smelting ores.
2,761 (1861). G. Evans, Treating peat.
2,787 (1861). A. Prince (com. from A. Charlier), Furnaces for reducing zinc-ores.
2,813 (1861). G. Simpson, Boring apparatus for mining purposes.
2,819 (1861). R. A. Brooman (com. from E. Aubertin), obtaining alkaline phosphates.
2,845 (1861). M. Henry (com. from A. M. de la Mothe), Treating iron and steel.
2,850 (1861). W. Clark (com. from F. A. A. Dufournel), Applying electricity in refining cast-iron to convert it into wrought-iron or steel.
2,875 (1861). J. Nixon, Ventilating coal or other mines.

2,893 (1861). P. A. J. F. PLINE-FAURIE and J. P. RICHARD, Apparatus for manufacturing fuel.
2,898 (1861). G. PRODON-BONNETON and M. G. PRODON, Apparatus for rolling metals.
12,902 (1861). J. HEMINGWAY, Machinery for working coal, shale, etc.

AUSTRIA.

PATENTS DELIVERED, PROLONGED, AND BECOME VOID, DURING JULY AND AUGUST.

267. C. FAUTREL, Baking and conglomerating waste fuel. [Prolonged.]
287. DR. C. M. FABER, Obtaining plastic crystal gold from an amalgama of chemically pure gold and quicksilver. [Prolonged.]
310. S. COILLARD and F. MAZELINE, Manufacture of fuel cakes. [Prolonged.]
274. D. BOCCASINI, Obtaining coke from lignites for smelting metals in blast-furnaces. [Become void.]
296. A MÜLLER, and Co., A peculiar process for extracting zinc from its ores. [Become void.]
299. C. PREISENHAMMER, Utilising the oxide of iron obtained in the manufacture of hydrogen gas for the manufacture of iron and steel. [Become void.]
310. E. I. GOBIET, Apparatus for collecting gases in blast-furnaces. [Become void.]
400. E. FILLAFER, Furnaces for roasting iron ores by means of the gases from blast furnaces. [Delivered.]
428. B. ROUQUAYROL, Ventilating apparatus for mines. [Delivered.]
430. J. F. ALLENDER, Cylinders of rolling mills for the manufacture of angle and flat iron. [Delivered.]
326. F. KISS, Extracting gold and silver. [Prolonged.]
336. A. A. FRECOT, Manufacture of fuel from peat. [Become void.]
348. J. SLAPP and M. MAYR, Manufacture of iron and steel.

BELGIUM.

PATENTS DELIVERED FROM NOV. 1ST TO NOV. 15TH.

16,878. B. F. PENNIMAN, Purifying coal and ores.
16,879. A. VAN WEYENBERCH, Modifications in Prud'homme's pumps for mines.
16,920. A. DE BERGUE, A separating blast-furnace with a reversed fire.
16,972. TREMOUROUX, Bros., and DE BURLET, A process for tinning cast-iron.
16,977. H. LÉONARD, A system of twyers.
16,978. F. DESMET, Petroleum lamps for miners.

FRANCE.

CURRENT LIST OF PATENTS.

62,913. COURTIN, Preventing the rupture of cables in mine-shafts.
62,917. EATON, Construction of coke kilns.
62,981. GLAUS, Tempering steel.
62,986. JONES, Machines for extracting coal and ores.
62,988. LABOULAIS, Obtaining iron, steel, pig-iron, &c., direct.
62,989. LAVÉGA, Applying steam injectors to metallurgical fire-places.
63,071. GRONIER, jun., Apparatus for purifying old zinc.
63,123. BRUN and STOEHK, Simultaneously manufacturing nitrate of potash and carbonate of soda by means of sulphate of potash and nitrate of soda.

63,150. BERNHARD, Artificial coal.
63,156. COUILLARD, Conglomerating small fuel.
63,164. HARRISON, Puddling iron and steel.
63,176. PILON, Retort furnaces.
63,188. GONNET and CÔTE, Smelting steel by means of coke.
63,233. LESIEUR, Preparing phosphates of ammonia and magnesia by means of sulphate and chlorhydrate of ammonia.
63,268. PÉTIN, GAUDET, and Co., Puddling iron and steel.
63,272. RASTOUIN, Converting French iron into steel by means of a cementing prosess.
63,285. CHRISTOFLE and Co., Plating aluminium bronze on other metals.
63,305. POTIRON, Re-action cartridges for mining purposes.
63,316. BROWN and ROBINSON, Manufacture of soda and sulphuric acid.
63,353. HENOCH, Manufacturing conglomerated fuel.
63,369. TORCHON, Coating metals with tin, lead, etc.
63,387. LANET, Manufacturing salts of iron from the scoriæ of iron works.
63,403. BOURIEZ, Manufacturing conglomerated coal.
63,418. LESIEUR, Preparing alkaline phosphates.
63,419. MARGUERITTE, Manufacturing sulphate of ammonia by means of plaster.
63,420. MARTIN, Apparatus for washing ores in general.
63,476. KIND, Sinking shafts of mines.
63,493. BRONDE, Conglomerating small coal for obtaining fuel-cakes.
63,494. BRONDE, Manufacturing a kind of fuel, called "Marseilles coal."
63,498. THE GENERAL ASPHALT COMPANY, Extracting bitumen.
63,623. FOURNERON, jun., Machine for conglomerating coal.
63,653. LASSERRE, Machine for conglomerating small coal and coke.
63,680. DEBRIE, Manufacturing alkaline carbonates by means of alkaline silicates.
63,795. SANDERSON, Manufacture of armour plates.
63,802. BLOT and LARIVIÈRE, A circular sawing bench for schist, slate, and all minerals.
63,838. DEBRIE and MAROT, Manufacturing sulphuric acid by means of earthy sulphates.
63,879. LIBOTTE, A puddling and reheating furnace.
63,891. WEBSTER, Manufacture of zinc.

THE NETHERLANDS.

PATENT DELIVERED SINCE OCT. 2ND.

14. W. F. STREET, Treating petroleum and other mineral oils.

SAXONY.

PATENTS GRANTED IN 1864.

12. J. WEBSTER, Extracting zinc.
14. W. BALK, Furnaces for smelting ores and metals.

UNITED STATES.

PATENTS ISSUED FROM OCT. 18TH TO NOV. 8TH.

44,518. D. DICK, Rock and ore crushers.
44,519. W. P. DOWNER, Refining petroleum and other oils.
44,520. L. ELSBERG, Solidifying peat.
44,525. P. G. GARDINER, Gold and silver amalgamator.
44,526. P. G. GARDINER, Machine for washing minerals.
44,557. N. O. SAWYER, Machine for condensing peat

44,580. A. W. Hall, Rock breaking device.
44,767. A. B. Crosby and R. L. Thompson, Apparatus for roasting and treating gold and silver ores.
44,769. C. H. Griffin, Improved ore roaster.
44,775. J. N. Phelps, Improved amalgamating apparatus.
44,817. B. P. Penniman, Purifying coal and ores.
44,819. J. T. Plass, Machines for crushing ores.
44,872. H. S. Lucas, Reduction of iron and other ores.
44,881. S. R. Niles, Improvement in twyers.
44,898. J. J. Storer, Amalgamating gold and silver.
44,906. R. P. Wilson, Roasting and desulphurising ores.
44,940. R. Covert, Artificial lump coal.
44,986. R. Spencer, Decomposing and desulphurising ores.
44,989. J. D. Whelpley, Improvement in ore crushers.
44,944. J. H. Cornell, Improved artificial fuel.

SPECIFICATIONS PUBLISHED, AND PRICES.

From Oct. 22nd to Nov. 19th.

*** Specifications will be forwarded by post on receipt of price and postage at Her Majesty's Patent Office, 25, Southampton Buildings, London, W.C.—The amount of postage may be estimated from the price, as follows:—Where the price does not exceed 1*s.* 6*d.*, postage will be 1*d.*; above 1*s.* 6*d.*, and not exceeding 3*s.* 4*d.*, it will be 2*d.*; above 3*s.* 4*d.*, and not exceeding 6*s.* 4*d.*, it will be 4*d.*—Sums exceeding 5*s.* must be remitted by P. O. O., on Holborn Office, payable to *Bennet Woodcroft*.

265 (1864). H. Bessemer, Manufacture of armour plates; 10*d.*
266 (1864). W. E. Newton (com. from N. Basset), Manufacture of aluminium; 4*d.*
267 (1864). J. G. Jones, Machinery for getting coal; 1*s.* 6*d.*
315 (1864). W. Taylor, W. Molineux, and H. Harrison, Puddling furnaces: 8*d.*
338 (1864). W. C. Stobart, Coke ovens: 8*d.*
341 (1864). B. Todd, Preventing the oxidation of iron; 4*d.*
343 (1864). F. W. Webb, Manufacture of rails; 10*d.*
346 (1864). P. Spence, Manufacture of sulpho-cyanide of ammonium; 4*d.*
355 (1864). T. V. Lee, Kilns for coking; 4*d.*
358 (1864). G. Davies (com. from J. Smith and J. R. Savage), Manufacture of sulphuric acid: 4*d.*
360 (1864). J. H. Johnson (com. from A. Pollak), Manufacture of superphosphates; 4*d.*
369 (1864). J. Henderson, S. C. Child, and W. L. Duncan, Rails; 8*d.*
372 (1864). W. Drake, Manufacture of iron: 4*d.*
399 (1864). F. C. P. Hoffmann, Crushing and washing ores; 4*s.* 6*d.*
454 (1864). E. A. Cotelle, Concentrating and distilling sulphuric and other acids; 1*s.*
460 (2864). A. Wall, Fuel: 4*d.*
463 (1864). B. Jones, Obtaining sulphur from alkali waste; 4*d.*
465 (1864). F. S Claxton, Casting metals over metallic cylinders; 4*d.*
476 (1864). G. Parry, Treating slag; 4*d.*
479 (1864). J. Grantham, Manufacturing compressed fuel; 4*d.*
491 (1864). P. H. Muntz, Yellow metal sheathing; 4*d.*
497 (1864). F. Weil, Coating metals; 6*d.*
510 (1864). J. Robinson (com. from J. Kennedy), Rolling railroad and other bars; 10*d.*
521 (1864). J. P. Raeburn, Obtaining oil from coal.
534 (1864). W. Clark (com. from N. O. André, jun.), Utilising refuse tinned iron; 4*d.*
580 (1864). W. E. Newton (com. from L. P. R. and L. R. De Massy), Manufacture of baryta and strontia; 4*d.*

Current Review of Mining, Quarrying, and Metallurgy.

CORNWALL, DEVON, AND WEST SOMERSET.

THE stagnation in mining enterprise in these counties continues without any relief. There are scarcely any changes to notice, and these, with very few exceptions, are for the worse. Several mines have been abandoned within the last two months, and among others *Chiverton Valley*, one of the new undertakings set to work in the district of that name. It seems probable that several other mines must yet stop; and if about two-thirds of the new concerns recently started in the Chiverton district were to follow the example of Chiverton Valley it would most likely be the wisest thing they could do. The tin standard remains unaltered; the copper standard has advanced about 3*l.* during the month.

As to alterations in mines:—At *Great Wheal Vor* the sinking of Ivey's shaft is suspended to drive the 162; sinking will be recommenced in about a month. The new whim commenced drawing on Nov. 15th, and works well. A breakage of the piston rod of the 85" engine occurred on Nov, 17th at 9 o'clock in the morning, but the engine went to work again on the 21st, and the water has been some days in fork. In the 162 end east of Ivey's there is a splendid lode worth 300*l.* per fathom. The 162 end west of Metal, driving to meet this, is also worth 300*l.* per fathom; the two ends are now a little under 20 fathoms apart. The next sale will not suffer in consequence of the breakage.

At *East Vor* there are good stones of tin in the engine shaft. At *Trelyon Consols* the long-expected north and south lode has been cut in the 20 fm. level west, and is stated to be worth from 10*l.* to 12*l.* per fm. *Prosper United* is looking well, and when the new engine is at work at Hand's shaft it is said that the returns will be much increased. It is fortunate that this engine is up, for the stoppage of Wheal Anna will throw a great quantity of extra water into the mine. *St. Ives Wheal Allen* has improved lately and the returns are increasing, and, even with present price of tin, will, it is stated, soon meet the cost if the present progress continues.

South Frances is looking poor, and the three lower levels are suspended during the sinking of Pascoe's shaft to the 134. At *Wheal Harriett* there are indications which are putting the brokers on the *qui vive* in expectation of the discovery of one of those moderately rich, but extremely short, bunches of tin which are characteristic of this mine.

At *Wheal Seton* the 4 bottom ends will yield 42 tons of good ore per fm. The *West Briton* states that from reliable authority under a more energetic management a 5*l.* dividend might be as easily given as 4*l.* At *North Roskear* the machinery which has been erected at a very great expense is now complete and works well. There being a large quantity of tin stuff lying in the levels, which was broken during the erection of the machinery, it will now be brought to surface and sent to stamps. At *East Pool* the dry season has of course been against returning tin, but the agents state that the prospects of the mine were never better than at present. At *West Tolgus* the bottom of the mine is looking very well. At *East Carn Brea* No. 3 lode recently cut in the 70 is worth 2 tons of good ore in the eastern end, and

1 ton in the western. The winze sinking under the 60 on this lode is down from 6 to 7 fms., and is worth 4 tons per fm, which speaks well for the course of ore to the 70, as the 70 east is improving.

Great Wheal Busy is said to have improved in the bottom levels. The 140, west of the cross-cut, is valued at 12*l.* per fm., the 140 east, 25*l.* per fm.; the 140 west, 30*l.* per fm.; the 140, east of Offord's, 35*l.* per fm. A winze below the 90, on a lode of tin, is valued from 45*l.* to 50*l.* per fm. At *St. Day United* Opie's shaft is down 7 fms. below the 184, worth 50*l.* per fm. At *Falmouth and Sperries* the eastern part of the mine is reported to be looking well, and to this part special attention is now to be devoted. The propriety of drawing up the pit work at Tippet's engine shaft will be considered if no improvement takes place in that part.

At *Cargoll* Michell's engine shaft is sunk to the 120; the lode is 4 feet wide, composed of blende, copper, and lead ores blended together, worth from 45*l.* to 50*l.* per fm. A plat is now being cut on this lode said to be yielding fine stones of copper ore worth 27*l.* per fm. At *North Shepherds* an improvement is reported in the 20 end west of engine shaft; the lode is 2 feet wide producing stones of lead ore.

The following report has been addressed to the shareholders in *East Caradon* by Captain Seccombe:—"November 8: I am sorry to say that our levels have not been looking so well for some time past; but I hope you will not dispose of your interest at the present price. I consider our chances of discoveries to be very good. We are expecting to cut the south lode in the 80 cross-cut in two or three weeks. Williams's shaft is sunk to the 90, and the cross-cut is commenced to drive south towards the lodes. I expect it will take six months from this time to see the caunter lode. Seccombe's shaft will, we hope, be sunk to the 50 perpendicular, and Seccombe's lode cut by the end of February next; and I have no doubt when this is done good discoveries will be made. I have great expectations from these points, and continue to hold a large interest." A writer to the *Mining Journal* states that *Hingston Down*, although so much neglected in the market, will become one of the best mines in East Cornwall, and vie with its neighbour South Caradon, which stands on the opposite hill. The writer goes on to state that this mine is situated between Devon Great Consols and South Caradon, but does not say how many miles away from each, and the comparison is about as relevant to the value of the mine as to state that Plymouth is between Exeter and Truro. At *Kelly Bray* the lode is worth 20*l.* per fm. At *Wheal Arthur*, the lode in the stope in the back of the 15 fms. level is worth 3 tons of copper ore per fm.

Durlo mine is to stop and the materials to be sold. *Wheal Nelson* materials are also advertised for sale. Mr. Francis Pryor retires from the management of *St. Day United*. On November 5th 100 shares in *East Downs* were sold by auction at Redruth, and were knocked down in several lots at 3*l.* 5*s.* per share, the reserved price. *Charlotte United* was offered for sale by auction on October 25th, but did not meet with a bidder. About 25,000*l.* have been expended on this mine. The origin of the difficulties which have led to this stoppage may be traced to the scandalous conduct of numerous landholders in the neighbourhood of Marazion.

Among transactions at mine meetings:—At *Chiverton Valley* meeting (at the end of October) it was unanimously resolved to stop the works and divide the assets. At *Falmouth and Sperries* meeting (on October 25th) relinquishments of 327 shares were received. At *Wheal Trannack* meeting the mine was subdivided into 1,920 shares, and Captain Bowden of Camborne Vean, appointed consulting agent. At *Wheal*

Crofty meeting (on October 31st) Mr. T. W. Field was appointed purser in the place of the late Mr. James Lanyon. At *South Frances* meeting (on November 7th) the *West Briton* states "The question of mine accounts was again discussed, and we notice with pleasure that two leading and highly successful mine adventurers—Mr. William Harris, of Pool, and Mr. J. C. Lanyon, of Redruth—carried a resolution that at every future meeting a balance-sheet shall be laid before the adventurers. This is as it should be in all mines; and such balance-sheet should always be published with the report." We cordially concur with the *West Briton* in these remarks. A large number of mine accounts are at present a mere farce, and give no information to the shareholders as to the real position of the mines. At *Hallenbeagle* meeting (on November 12th) it was resolved that future meetings be held alternately in London and Cornwall. At *West Damsel* meeting (on November 14th) a resolution was passed to purchase the adjoining sett of Wheal Damsel together with the materials for 1,350*l*. At the next meeting this resolution will be confirmed or otherwise. A call of 5*l*. per share will be required to meet the purchase if it should be made. At *North Chiverton* meeting (on November 19th) and at *Wheal Arthur* meeting (on November 21st) Mr. J. H. Murchison was appointed secretary in the room of the late Mr. Dunsford.

WALES AND THE BORDERS.

South Wales.—The state of the iron trade continues satisfactory, and makers have their books well supplied with orders. It was feared some weeks ago that the starting of the Staffordshire works would take some orders away from South Wales, but this has not been the case, and without a doubt the ironmasters are making unusual efforts to retain the specifications which fell to their hands through the turnout in Staffordshire. Tin-plate makers are still complaining of a scarcity of orders, though the reduction in the bank rate of discount has given a slight impetus to the home demand. The demand for railway iron continues to improve.

It is stated that a change of management has again taken place at the *Pontypool* ironworks, Mr. Edwin Richards, who has been the manager for the last three or four years, having left. It is not yet definitely known who will be Mr. Richards' successor, but it is reported that Abersychan and Pontypool are likely to be included under the same management.

The *Hirwain* Works are now going on steadily, and a large number of hands are employed. The *Yniscedwyn* ironworks, which have been idle for the last three or four years, have resumed operations, and a furnace has been constructed upon an entirely new principle. It is stated that these works are to be carried on by a limited liability company, and there is every probability that they will be conducted with vigour and energy, giving employ to a very large body of men and to the advantage of the whole district.

The *Old Forge* Ironworks, Llanelly, the property of Mr. W. H. Nevill, are being considerably enlarged, and a new guide-mill is about to be built. When these extensions are completed some 50 or 60 additional hands will be employed. Messrs. Oneslow and Co.'s new lead works, at *Pembrey*, are nearly completed, and it is expected they will be opened the first week in December. Mr. David Stringer, late of the Cambrian Lead Works, Llanelly, has been appointed manager, and, when once the works are in operation, upwards of 100 hands will receive regular employment.

The briskness in the steam-coal trade which was mentioned in our last is still maintained, and there has been no lack of employment at the various collieries. Lantwit and other house-coals also command a ready sale.

During the month of October 130,865 tons of coal were exported from *Cardiff*, against 125,700 tons in the previous month, being an increase of 5,000 tons. The exports of iron reached 7,422 tons, as compared with 10,474 tons in September, the decrease being mainly observable in the shipments to America; 2,263 tons of preserved coal were shipped against 3,120 tons in the previous month, and the number of vessels engaged in the export trade was 312. For the ten months of the present year the total exports reached 1,221,364 tons of coal, and 134,773 tons of iron, as compared with 1,217,853 tons of coal and 144,408 tons of iron during the same period in 1863, and 1,108,716 tons of coal and 155,998 tons of iron in 1862. The exports from *Newport* during October amounted to 26,390 tons of coal in 54 ships, against 24,708 tons in September, and 19,920 tons in the corresponding month of last year. Coastwise the shipments were 54,230 tons as compared with 44,079 tons in the previous month, and 42,588 tons in the corresponding month of 1863. The exports of iron reached 7,442 tons against 4,420 tons in September, the increase being principally in shipments to New York. The exports from *Swansea* reached 42,275 tons, against 47,528 tons in September, and 43,480 tons in October, 1863. There were shipped coastwise 26,313 tons of coal and 4,406 tons of patent fuel, as compared with 17,673 tons of coal in the previous month, and 17,187 tons in the corresponding month of last year. From *Llanelly* there were exported 8,778 tons, against 11,168 tons in September, and 6,761 tons in the corresponding month of 1863; and the coasting shipments were 26,161 tons, as compared with 16,722 tons in the previous month, and 15,133 tons in October of last year.

The imports into Swansea include:—136 tons of copper ore from Lisbon, 143 tons from Rouen, 1,157 tons from Cuba, 250 tons from Coquimbo, 170 tons from Guayacan, 516 tons from Hondeklip, and 80 tons from Caldera; 238 tons of zinc ore from St. Malo, and 123 tons from Almeira; 160 tons of sulphur ore from Pomona; 740 tons of iron ore from Cherbourg; 254 tons of silver ore from Caldera; and copper regulus from Caldera.

GLOUCESTERSHIRE AND EAST SOMERSETSHIRE.—The imports into Bristol include:—60 tons pig-iron from Glasgow and Belfast; 90 tons lead ore from Douglas; 100 tons of silver ore from Douglas; 112 tons of sulphur ore from Arklow; 31 barrels of sulphur from Liverpool; 38 tons of iron from Gothenburg. During the month of October, 1,340 tons of coal and 409 tons of iron were exported oversea from Bristol, as against 844 tons of coal and 390 tons of iron in September, showing an increase of 496 tons of coal and 19 tons of iron; compared with the corresponding month last year there has been an *increase* of 359 tons in the exports of coal, but a *decrease* of 3,852 tons of iron.

NORTH WALES.—The quantity of gold returned from *Castell Carn Dochan* for the four weeks ending November 22nd was 10 oz. 15 dwts. 8 grs. from 79 cwts. of quartz crushed. The total amount returned since May 21st up to November 8th was 120 ozs. 2 dwts. 4 grs.

MIDLAND COUNTIES, SOUTH LANCASHIRE, AND SOUTH YORKSHIRE.

STAFFORDSHIRE AND WARWICKSHIRE.—The coal and iron trades of this district have been exceedingly quiet all through the month, although

there has been considerable difficulty in obtaining as much as was required of either. The pits have not yet been got into work to a sufficient extent to enable consumers of coal to obtain all that they require without having recourse to other districts; and the recent short supply of fuel, and the scarcity of really skilful puddlers, have together kept down to an inconvenient level the quantity of puddled iron produced. Coal continues to be brought into the district from Lancashire and North Wales, but only in small quantities as compared with a short time since.

SOUTH YORKSHIRE.—A company called *Henry Briggs, Son, and Co.* Limited, is announced, the object of which is to work the Whitwood and Methley Collèries, near Normanton. The capital is to be 135,000*l.*, in 9,000 shares of 15*l.* each.

NORTHERN COUNTIES, NORTH LANCASHIRE, AND NORTH YORKSHIRE.

NORTHUMBERLAND AND DURHAM.—The check felt in the iron trade in consequence of the fluctuation in the money market having been removed a more healthy tone now prevails in the whole district. There has been an unusually large demand for pig-iron, and the rolling mills have also been well employed. It is expected that the *Ridsdale* mines will shortly be in full working order.

The state of the blast furnaces on Nov. 19th was as follows:—

Place and Owners	In.	Out.	Tot.
Eston—Bolckow and Vaughan	9	—	9
„ Clay Lane Co.	6	—	6
„ South Bank Co.	3	—	3
Cargo Fleet—Jones, Dunning, and Co.	2	—	2
„ Cochrane and Co.	4	—	4
„ Gilkes, Wilson, Peace, and Co.	5	—	5
Middlesborough—Bolckow and Vaughan	4	—	4
„ Hodgkins and Co	2	—	2
Port Clarence—Bell Brothers	6	—	6
Norton—Warner, Lucas, and Barrett	3	—	3
Stockton—Holdsworth and Co.	3	—	3
Ferryhill—Rosedale Iron Company, Limited	3	—	3
Newport—B. Samuelson	3	—	3
Thornaby—W. Whitwell and Co.	3	—	3
Darlington—South Durham Co.	2	1	3
Witton Park—Bolckow and Vaughan	4	—	4
Stanhope—Weardale Iron Co., Limited	1	—	1
Towlaw—Weardale Iron Co., Limited	5	—	5
Consett—Derwent Iron Co., Limited	8	10	18
Total	76	11	87

STATEMENT OF FURNACES BUILDING.

Normanby—Jones, Dunning, and Co.	1	nearly ready.
Eston—South Bank Co.	2	nearly ready.
Ditto ditto	1	¾ completed.
Middlesborough—Hopkins, Lloyd, and Co.	2	ditto.
Eston—Bolckow and Vaughan	2	½ completed.
Fighting Cocks—Middleton Iron Co.	2	ditto.
Eston—South Bank Co.	2	commenced
Middlesborough—Stevenson, Jacques, and Co.	2	ditto.
Cargo Fleet—Swan, Strawbenzie, and Co.	2	ditto.

Although ten furnaces appear out of blast at Consett, it must be borne in mind that they never were in blast at all to the present proprietary, the works being the property of the defunct District Bank of Newcastle; and the eight furnaces in blast at Consett, and the very extensive rolling-mills attached thereto, are now being worked by a body of the late shareholders of the Bank, the remaining ten furnaces never having been in blast by them at all for several years.

The *Portrack* new malleable iron works, at Stockton-on-Tees, under the management of Mr. Hill, late of the Consett Iron Works, are being extensively enlarged, several new furnaces are being erected, and when all the arrangements are fully completed the works will extend over some acres of ground.

The coal trade has shown continued activity in all its branches, but the stormy weather has caused a scarcity of shipping at the various ports and a consequent advance in freights.

NORTH LANCASHIRE.—It is reported that the *Parkside* Mining Company, who have for several months been making a vigorous search for iron ore on the Lowfield House Estate, near Lindal have succeeded in finding ore at a depth of 9′ which it is supposed will leadto a large deposit.

SCOTLAND.

The iron trade continues very brisk, and it is reported that new works are being erected at *Coatbridge* for the manufacture of sheet-iron. It is stated that the *Gartness* ironworks have been sold to Mr. Hawkesworth the proprietor of a large steel manufactory in the neighbourhood of *Linlithgow*, and that the manufacture of cast-steel and steel shot and steel, in addition to malleable iron, is to be begun immediately. The shipments foreign and coastwise of pig-iron from the various Scotch ports during November have been 55,704 tons against 42,878 tons in the corresponding period of last year.

During the early part of November an accident occurred at the *Calder* ironworks which caused the furnaces to be put out of blast for a time.

Coals have been in active demand, and in some instances have shown an upward tendency in prices. The shipments foreign and coastwise during November have been 42,878 tons, against 98,581 tons in the corresponding month of last year.

CONTINENT OF EUROPE AND MEDITERRANEAN COUNTRIES.

FRANCE.—There is still no improvement in the iron trade to notice, and at some of the works at St. Dizier the masters are asking for orders: in the Moselle prices are better sustained, but in most instances the demand is limited to consumption. The *Ottange* company will, it is said, light a fourth furnace before the end of the year, and intend shortly to commence the erection of a fifth.

BELGIUM.—Very little active business has been reported, and there has been a marked falling off in the demand for merchant iron. The coal trade continues to be in a highly satisfactory condition.

SWEDEN.—We extract the following particulars of the progress of mining and metallurgical industry in Sweden during 1862 from some

statistics compiled from the *commerce collegü berättelse* by M. Turley, civil engineer. The number of ironstone mines at work was 527, producing 524,217 tons of ironstone. The number of furnaces in blast was 221, and the production of pig-iron amounted to 234,754 tons. The quantity of steel and manufactured iron was 26,711 tons. The 16 principal copper smelting works produced 1,995 tons of fine copper. The chief silver mine, the Sala mine, together with two or three inferior ones, furnish 2,418 lbs. of refined silver. There were 5 lead smelting works producing 520 tons. The Ammeberg mines furnished 10,020 tons of zinc ores. The quantity of coal raised was 173,608 tons. The number of workmen employed in the various mines and works was 22,120.

BAVARIA.—The following statistics relate to the produce of the mines in the Bavarian States during 1862:

Number of Works.	Produce.	Quantity in Tons.	Value at the Works.	Workmen.	Women and Children.
279	Iron Ores	51,648	£15,511	844	1,815
8	Lead Ores	15	250	117	318
5	Quicksilver	3½	717	33	38
8	Fahlerze	132	484	46	91
1	Antimony	16	186	18	70
8	Pyrites	2,531	1,173	66	158
180	Coal and Lignite	266,790	96,974	2,515	4,593
53	Graphite	625	3,148	60	100
28	Gypsum	12,311	2,630	53	51
34	Slate	1,299	935	142	372
8	Salt	50,487	356,539	2,294	4,562

NORTH AMERICA.

NOVA SCOTIA.—The Gold Commissioner's Report gives the following returns of quartz crushed and yield of gold, in the various districts, for the quarter ended 30th September. Isaac's Harbour, quartz crushed 53 tons; yield of gold 99 oz. 17 dwts. 6 grs. Wine Harbour, quartz crushed 199 tons; total yield 220 oz. 10 dwts. 15 grs. Sherbrooke, quartz crushed 266 tons; yield 378 oz. 6 dwts. 1 gr. Tangier, quartz crushed 69 tons; yield 88 oz. 5 dwts. 1 gr. Montague, quartz crushed 54 tons; yield 134 oz. 4 dwts. 10 grs. Waverley, quartz crushed 937 tons; yield 855 oz. 3 dwts. 3 grs. Oldham, quartz crushed 222 tons; yield 170 oz. 2 dwts. 1 gr. Renfrew, quartz crushed 91 tons; yield 111 oz. 19 dwts.

LAKE SUPERIOR REGION.—A very important discovery of large deposits of iron ore has been made near *Goulais Bay*, on the Canadian side of Lake Superior, not far from Sault, and within five miles of a good harbour.

CALIFORNIA AND BORDER TERRITORIES.—An extensive cave occurred in the old works of the *Gould and Curry* mine some 400 feet south of the office and buildings. There is a large hole on the surface situated between the Gould and Curry house and the Savage Mining Company shaft, of some 50 feet in diameter and about 20 feet deep. The caving

commenced in the D street tunnel and has been gradually working its way to the surface. An immense chamber in the old workings has been filled up by this cave at no cost whatever, which otherwise would have compelled the company to go to heavy expense to do so. On the other hand however the old spiral stairway affording access to the mine has been entirely destroyed. This cave has been anticipated for some time, and so far from doing any permanent injury to the mine has exposed new bodies of ore heretofore unknown, and which had been passed by in the old working of 1862.

There have been brought to San Francisco 13 bars of silver from the *Triunfo Gold and Silver Mining Company*, valued at $3,187. A 10 stamp mill has recently been put up at the mine, and the above is the result of the first crushing.

The largest deposit of native salt yet found on the western side of the American Continent has been discovered at San Antonio, in Nevada State. It consists of a plain, said to be ten miles square, covered with salt from 6" to 3' in depth.

AUSTRALASIA.

VICTORIA.—At Port Phillip and Colonial the quantity of quartz crushed during September was 4,365 tons, yielding about 2,220 ozs. of gold, or an average of 10 dwts. 4 grs. per ton. The receipts during August were £1,805, payments £1,303; leaving a profit of £502.

SOUTH AUSTRALIA.—The Australian Companies have advices up to September 26th. At *Kapunda* the quantity of ore raised in July was 243 tons of 17% average produce. The furnaces were in full work and a good supply of fuel on hand.

From *Scottish Australian* the reports from Lambton Colliery state that the shipments of coal during September amounted to 7,047 tons.

At *Yudanamutana* operations generally were reported to be progressing very satisfactorily.

Record of the Mining and Metal Markets.

METALLIC-ORE MARKETS.

TIN ORE.—There has been no alteration in the tin standard since our last, and quotations still stand at:—

Superior Fine	... £97	Superior Common ...	£94
Second Fine	... £96	Second Common ...	£93

COPPER ORE.—At the five public copper ore sales included in our present number—four Cornish sales (on the 3rd, 10th, 17th, and 24th) and one Swansea sale (on the 8th)—the number of tons of ore, number of tons of fine copper, amount of money, average produce per cent., average cost per tonof ore, average cost per ton of copper in ore, average returning charges for the total number of tons of ore required to produce a ton of fine copper (calculated on Sir W. Logan's formula, see *Mining and Smelting Magazine*, Vol. VI. p. 139) and the average total cost of a ton of fine copper to the smelter, at each sale, and for

the whole month have been as follows—which show, as compared with the last month, an *increase* in the quantity of fine copper of 36 tons, 17 cwts., ¾ qr., and in the amount of money of 3,936*l.* 8*s.* 6*d.*, with an *advance* in the cost of copper of 18*s.* 7½*d.*, the produce remaining the same.

Date.	Quantity of Ore.	Quantity of Fine Copper.	Amount of Money.	Average Produce °/₀.	Average Cost per Ton of Ore.	Average Cost per Ton of Copper in Ore.	Average returning Charges.	Average Cost of Fine Copper.
	tons.	t. c. qr.	£ s. d.		£ s. d.	£ s. d.	£ s. d.	£ s. d.
Nov. 3	3,049	212 14 0	16,986 14 6	7	5 11 5	79 17 3	17 3 4	97 0 7
„ 8	* 898	94 2 0	7,850 0 0	10 17/18	8 14 10	83 8 5	14 15 5	98 3 10
„ 8	† 769	146 11 1½	12,355 13 0	19 1/16	16 1 4	84 6 0	12 12 5½	96 18 5
„ 10	2,575	167 5 0	13,244 15 6	6½	5 2 10½	79 3 10	17 18 11½	96 17 9½
„ 17	5,111	255 2 0	20,264 14 0	5	3 19 3½	79 8 9½	20 0 4½	99 9 1½
„ 24	3,247	196 10 0	15,789 0 6	6 1/16	4 17 3	80 7 0	18 5 3	98 12 3
	15,649	1,072 4 1½	86,490 17 6	6 7/8	5 10 6½	80 13 3¼‡	17 5 11½	97 19 3
	Totals for the Month:			Averages for the Month:				

* British and Irish Ores. † Colonial and Foreign Ores. ‡ Equal to 16*s.* 1½*d.* per Unit of Copper.

LEAD ORE.—Comparing the prices of lead ores sold during November with those sold during the previous month we find that prices in general show a slight decline.

COAL AND MINERAL OIL MARKETS.

LONDON, COAL.—Mr. J. R. Scott, Registrar of the London Coal Exchange, has favoured us with the following statistics of this market for the month of November, of which detailed particulars will be found in his monthly published returns. The total quantity of coal, culm, and cinders imported into London by sea, railways, and canals, during November was 476,043 tons, against 485,750 tons during the corresponding month of last year, showing a gross decrease of 9,707 tons, as follows:—

	Nov. 1863	Nov. 1864	Increase (+) or Decrease (—)
Seaborne ...	302,734	257,903	—44,831
Rail-borne ...	183,016	218,140	+35,124
	485,750	476,043	—9,707

Of the total of 476,043 tons imported in November, 51,830 tons have been again exported by sea, rail and canal, leaving 424,213 tons for the nett consumption of the metropolis for the month. As no account of the exports was kept until the commencement of the present year, no comparison can be instituted on this point with the corresponding month of 1863.

The particulars of the quantities imported by sea, and the ports of export, for the month of November, 1863 and 1864, are as follows:—

	1863. Tons.	1863. Ships.	1864. Tons.	1864. Ships.
Newcastle	120,647	277	130,235	262
Seaham	15,346	59	6,777	27
Sunderland	96,790	219	68,669	153
Middlesbro'	6,783	21	3,642	14
Hartlepools	48,900	165	37,939	127
Blyth	2,216	8	889	3

	1863. Tons.	1863. Ships.	1864. Tons.	1864. Ships.
Scotland	1,878	10	228	4
Wales	5,029	14	6,074	19
Yorkshire	1,765	24	583	8
Small	2,573	5	1,818	5
Cinders	807	5	1,049	9

The particulars of the quantities imported by rail and canal for the same month are as follows:—

	1863. Tons.	1864. Tons.		1863. Tons.	1864. Tons.
London & N. Western	89,688	90,099	South Western	379	3,164
Great Northern	61,223	83,208	London, Chatham, & Dover	382	479
Great Western	6,566	14,957	Tilbury and Southend	69	50
Great Eastern	12,075	13,193	Grand Junction Canal	950	
Midland	12,631	12,948			
South Eastern	„	42			

The particulars of the 51,830 tons exported during the last month are as follows:—

(No. 1.)—Rail-borne Coal passing through district, *in transitu.*	16,212
(No. 2.)—Sea-borne Coal exported coastwise or to foreign parts, by rail or canal	33,826
(No 3.)—Rail-borne Coal ditto ditto ...	1,792

The following is a statement of the comparative imports by sea and rail for the 11 months ended Nov. 30th, by which it will be seen that the imports by sea have *fallen off* 175,285 tons, and those by rail *increased* 505,389 tons, showing a nett increase of 330,104 tons for the 11 months.

Seaborne imports for 11 *months.*	*Railborne imports for* 11 *months.*
1863—8,771 ships ..... 2,995,642 tons.	1863 ... .1,613,029 tons.
1864—7,510 „ .....2,820,357 „	1864 .....2,118,418 „
Decrease..... 175,289 „	Increase ..... 505,389 „

During the first week in November, the supply of coal was almost entirely cut off owing to the adverse weather; Hetton Wallsend, 22*s.* 6*d.*; Eden Main, 21*s.* 6*d.* On the 7th, the new ships arrived were 235; the market was very animated and a large business was transacted; Hartley's reduced 3*d.* per ton. On the 9th, new ships 39; there was a steady demand with an upward tendency in the prices of house-coal. On the 11th, new ships 27; a further advance in house-coal. On the 14th, new ships 38. On the 16th, new ships12. On the 18th, new ships 48; market active. On the 21st, 23rd, and 25th the arrivals amounted in all only to 51 ships; no alteration in the market. On the 28th, new ships 25. The market was entirely cleared out at last day's prices for all descriptions. On the 30th, new ships 41, an active demand at last prices. Hetton Wallsend, 23*s.*; Haswell Wallsend, 23*s.*; Hartlepool Wallsend, 22*s.* 9*d.*; Braddyll's Wallsend, 22*s.* 3*d.*; Eden Main, 22*s.*; West Hartley, 19*s.*

NEW YORK, *November* 15*th.* COAL.—The demand for house coal has been good but at irregular prices. Scranton, $10-$11; Lehigh, $10·50-$11; Cumberland $10·80.

PETROLEUM.—The market for this article continues very active. Crude is quoted, on spot, 45 to 46 cents. Refined in bond, on spot, 71 to 72 cents. Refined free, 87 to 88½ cents.

BOSTON, *November* 13*th.* COAL.—Sales of English Cannel have been made at $26 per ton. Pictou and Sydney have been quiet at $12·50 to $13. Anthracite has been in steady demand at $13 to $14.

PHILADELPHIA, *November* 13*th.* COAL.—There has been a fair demand and prices are steadily maintained.

PETROLEUM.—The market for this article has been excited and tending upward. Crude has been scarce at 42 to 43 cents. Refined in bond, 68 to 69 cents.

CONTRACTS.—The Admiralty require the supply of 600 tons of South Wales coal to be delivered at Vancouver's Island; 500 tons at Valparäiso, and 2,500 tons—one-third North of England, and two-thirds South Wales coal—at Fernando Po. The Admiralty also require 1,100 tons of South Wales coal at Halifax, Nova Scotia, and a supply of the same coal for the shipping of St. Vincent, Cape de Verde.

METAL MARKETS.

LONDON.—The metal market during the past month has been very quiet, and those who expected any great advance in prices, consequent on the easement in the money market, have found themselves mistaken. There is, however, an improved feeling in the trade, and we may reasonably look forward to a more healthy and flourishing market than has been the case for some time past.

IRON.—Staffordshire iron has been in slightly improved demand. Welsh bars and rails have been in good request; in Swedish there is no alteration to notice. A good deal of business has been done in Scotch pig-iron, although prices have fluctuated but little, and close the same as last month at 50*s.* 6*d.* cash.

COPPER.—The market for this article has been decidedly better; large purchases have been made, and the market cleared of many second-hand parcels. Tough cake 89*l.* 90*l.*; best selected 92*l.* In foreign a good business has been reported, and prices have considerably advanced, Burra Burra, 95*l.*; Kapunda, 100*l.*; Wallaroo, 92*l.*

TIN.—*Messrs. Von Dadelszen and North* state that the tin market has been very quiet, and what business has taken place has been mostly for export. Those operators and holders who were impressed with the idea, that with a return of confidence in mercantile affairs, and a reduction in the rate of discount, tin would be favourably affected, have been sadly disappointed. There has been a reduction 2% in the Bank minimum, and metals generally have shown a reaction from their lowest point. Tin, however, has been the exception. The cause is obvious to all, and is explained in a few words—our heavy stock goes on increasing. The quantity of tin here and in Holland on the 30th of November was as follows, compared with the two preceding years:—

	1864.		1863.		1862.	
	Slabs.	Tons.	Slabs.	Tons.	Slabs.	Tons.
Stock in Holland .	71,032 =	2,270	79,670 =	2,790	73,690 =	2,280
Arrived towards next Sale . .	66,204 =	2,120	50,358 =	1,775	57,998 =	1,800
Stock here . .		3,831		2,592		2,212
	Tons	8,221	Tons	7,157	Tons	6,292

The quantity of tin now afloat for England is 723 tons, against 656 tons last year; and to the Continent 141 tons.

The demand for English has been very good throughout the month, particularly for common, but official prices have seldom been acceded to. The supply has been fully equal to the demand, but there are no signs of prices being lowered in spite of the comparative low quotations for foreign. In the early part of the month a fair business was done in Straits at 94*l.* In Banca prices have fluctuated between 95*l.* and 96*l*, closing steady at the latter quotation. The Dutch market, which at one time was firm at 60 fl., has declined to 58½ fl. The official returns from Holland are as follows:—

		1864.	1863.	1862.
Stock on Warrants, 31st October .	Slabs	75,350	87,820	80,955
Delivered during November . .	,,	4,318	8,150	7,265
Stock on Warrants, 30th November .	,,	71,032	79,670	73,690
Arrived towards next Sale . .	,,	66,204	50,358	57,998

The arrivals of tin into London during November amounted to 15,998 slabs.

TIN PLATES.—There has been little doing in this article, and prices remain unaltered.

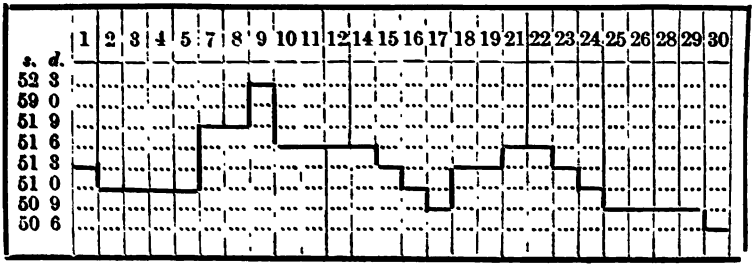
LEAD.—There has been rather more inquiry for this metal; good soft pig, 20*l.* 2*s.* 6*d.*-20*l.* 5*s.* 0*d.*; W.B. 22*l.* 10*s.* 0*d.*

SPELTER—The market for this article has been very flat, and few transactions have been reported; ordinary brands, 21*l.* 5*s.* 0*d.*; W.H., 22*l.*

BIRMINGHAM. IRON.—There has been a decided improvement in the iron market, but buyers have been postponing orders in hopes of purchasing on easier terms by waiting. Quotations have been as follows:—Common forge pig, 2*l.* 17*s.* 6*d.* to 3*l.* 5*s.* 0*d.*; mine forge, 3*l.* 7*s.* 6*d.* to 3*l.* 15*s.* 0*d.*; Hematites, 3*l.* 10*s.* 0*d.* to 4*l.* 5*s.* 0*d.*; Cleveland grey forge, 3*l.* 4*s.* 0*d.* to 3*l.* 12*s.* 6*d.*; Spiegeleisen, 6*l.* 15*s.* 0*d.*; Welsh bars, 6*l.* 15*s.* 0*d.* to 7*l.* 10*s.* 0*d.*; North Staffordshire bars, 7*l.* 15*s.* 0*d.* to 8*l.* 0*s.* 0*d.*

COPPER.—The market for this article has been very firm. Tough cake has been selling freely at 93*l.*, best selected 96*l.*, manufactured 100*l.*

GLASGOW. IRON.—The Scotch pig-iron market has been very quiet all through November, although on the whole prices have been pretty firmly maintained. On the 1st, the market opened buoyant and a considerable business was done up to 51*s.* 1½*d.* M. Nos. but before the close prices receded to 50*s.* 10½*d.* No. 1, G.M.B., 51*s.* 9*d.*; No. 3, 51*s.*; No. 1, Garlsherrie 57*s.* 6*d.*; Coltness 56*s.* 6*d.*; Calder 56*s.*; Glengarnock 52*s.*; Eglinton 52*s.* The market remained quiet, with very little fluctuation in prices, until the 7th, when there was a considerable improvement in the tone of the market, and a fair business was done up to 51*s.* 7½*d.* On the 9th, the market opened strong and prices went up 52*s.* 3*d.*, the highest cash price of the month. On the 10th, the market opened quiet and prices showed little variation until the 17th, when quotations went down to 50*s.* 7½*d.* On the 18th, however, the market was firm, and business was done up to 51*s.* 1½*d.* Prices remained firm until the 25th, when the market was very dull at 50*s.* 7½*d.* Since this date there have been little or no fluctuations, and we quote closing prices of M. Nos. at 50*s.* 6*d.* The following diagram shows, at a glance, the daily fluctuations of this market, the highest cash price of the day being given:—



PARIS, *November 28th.*—COPPER remains firm at the former quotations. English, 227½ fr.; Lake Superior, 260 fr.; Chili, 215-216½ fr. TIN was quoted at Banca, 257½ fr.; Straits, 252½ fr.; English, 252½ fr.

SPELTER.—This article does not seem to improve. Silesian with little demand was quoted at 58 fr.

COLOGNE, *November 28th.*—The metal market has been more active and buyers for large quantities have been taking advantage of the present cheap prices.

IRON.—Charcoal iron and Spiegeleisen have been quoted at (per ctr.) 1½-1⅔ thlrs.; coke pig-iron, 1⅓-1$\frac{4}{10}$ thlrs.; grey coke pig-iron, 1⅓-1$\frac{6}{10}$ thlrs.; Scotch pig No. 1, 1$\frac{5}{10}$-1$\frac{7}{10}$ thlrs.; iron in bars, 3⅓-3$\frac{4}{10}$ thlrs.

COPPER.—This article has been in better demand. Paschkoff, 40 thlrs.; American, 39 thlrs.; English, in blocks, 34 thlrs.; first quality rosette copper, 33 thlrs.; second quality rosette copper, 31-31½ thlrs.

TIN.—Banca, 36½ thlrs.; English, in blocks, 36 thlrs.

LEAD.—Refined, 6⅛-6½ thlrs.; unrefined, 6-6⅛ thlrs.

SPELTER.—This has been quoted at, 7½-7⅞ thlrs.; rolled, 9⅛ thlrs.

ANTIMONY.—Regulus of antimony, 16 thlrs.

BERLIN, *November 26th.* IRON.—The quotations for Scotch pig are merely nominal, closing at (per ctr.) 50 sgr.; English, 46 sgr.; Silesian charcoal pig-iron, 52 sgr.; coke pig-iron, 49-50 sgr.; old rails, 52 sgr.; bar-iron has advanced and in great demand, it is quoted at, rolled, 3⅞-4 thlrs.; hammered, 4-4⅛ thlrs.

COPPER.—This metal has been active, and the prices firm. Demidoff, 35 thlrs.; Swedish, 33-35 thlrs.; English best selected, 33½ thlrs.; tough cake, 32½ thlrs. (per ctr.).

TIN.—In this article little business was done. English, 35 thlrs.; Banca, 35⅞ thlrs.

LEAD.—Tarnowitzer, 6¾ thlrs.; Saxon, 6⅞ thlrs.

BRESLAU, *November 26th.* SPELTER.—Nothing has been done in this article, it was last quoted at 6⅞ thlrs.

STETTIN, *November 25th.*—At this market the demand for Scotch-pig and scrap-iron was large, and the prices firm, at 50-53 sgr.; English pig-iron, 46-47 sgr.

COPPER.—This article was quoted at 33-36 thlrs.; according to quality.

TIN.—Banca, 37-38 thlrs.

SPELTER has been quoted at 7⅞-8 thlrs.

LEAD.—Spanish 8⅛ thlrs.: German 6⅞-7 thlrs.

HAMBURGH, *November 24th.*—The market has been firm, and a rise in prices is shortly expected.

IRON.—Scotch pig, 2½-2⅝ mk.; Staffordshire descriptions, 7 mk.; nail-iron, 7 mk.; sheet-iron once rolled, 8½-8¾ mk.; Swedish in bars, 8½-8⅞ mk.

STEEL.—Swedish in boxes, 11½ mk. (per ctr.). Milan No. 00 in boxes of 138 lbs. ¼ sq. inch, 18 mk.; No. 0 $\frac{4}{16}$ sq. inch, 17 mk.

COPPER.—In this article buyers were ready with low prices, but the owners kept back, as they expect a rise soon. Drontheimer Röraas, 66 mk.; E.K.W. in blocks, 64 mk.; Demidoff, 68 mk.; Paschkoff, 85 mk.; Lake Superior, 68-72 mk.; Kapunda, 67 mk.; English best selected, 64 mk.; tough cakes, 62 mk.; English copper plates for roofing, 73 mk.; ditto for ships, 73 mk.

TIN.—This article has become firmer. Banca in blocks, 11¼-11½ sch.; English in blocks, 11⅛ sch.; in bars, 11¾ sch.

LEAD.—But little demand has been made for this article in the

market, and the price remains firm. German, 13½ mk.; English, 14½ mk.; English rolled, 15 mk.

SPELTER.—This article has been more in request but without causing a rise. Special kinds have been sought after for England, but only at higher prices. Silesian, 14¼ mk. Silesian plate zinc, 19 mk.; Vieille Montagne, 19½ mk.

YELLOW METAL was quoted at 56 mk.

NICKEL 4 mk. (per lb.).

QUICKSILVER, 28 sch.

AMSTERDAM, *November 26th.*—The price for Banca tin is kept high but without purchasers. In all the other metals the market was flat.

ROTTERDAM, *November 26th.* TIN.—Banca, 59½ fl.

LEAD from Eschweiler and Stollberg, 11⅛ fl.; from other parts of Germany 11½ fl.

NEW YORK, *November 15th.* IRON. The market for pig-iron has been only moderately active, but prices are better and close firm at $63-$65 for No. 1 Scotch, and $60-$65 for No. 1 American. Bar iron rules firm but the market is inactive; English has been quoted at $1·75-$1·90 for common, and $1·90-$2·05 for refined. American sheet has been in demand and firmly held.

COPPER.—American ingot has not been in much demand although prices have advanced, large sales of Lake and Baltimore having been made at 49c.-50c. per lb.

BOSTON, *November 13th.* IRON.—The market for pig-iron has been firm, but prices are quoted lower than in our last. Sales of Gartsherrie have been effected at $65. No. 1 American pig is scarce, and the sales have been in small lots at $62·50-$67·50.

PHILADELPHIA, *November 13th.* IRON.—There has been more enquiry for this article, and a better feeling in the trade generally, although not much has been done in the way of sales owing to the firmness of the makers, who are asking an advance on previous quotations with very reduced stocks of anthracite, foundry-pig has been scarce at $60-$62 cash.

COPPER.—This metal has been held more firmly with large sales of ingot at 49c.-50c. per lb.

STOCK AND SHARE MARKETS.

LONDON.—The market for Cornish mine shares has been very inactive during November, and as the public as yet show no inclination to invest in this class of securities, prices are generally weaker, and on the whole this market closes dull with a downward tendency. Business in the shares of the new iron companies is very trifling, as far at least as London is concerned, although there is probably more doing in these stocks in the provinces. In foreign mine shares a good business has been done, and prices have shown a remarkable advance taking all things into consideration. This market is fortunately free from the system of "rigging" which so discredits dealings in Cornish shares, and which, if persevered in, must ultimately stop all supplies of new capital from flowing into such unsatisfactory investments.

The following have been the principal alterations in prices:—

Advanced.

Wheal Chiverton	£¾	Cobre	£¾
East Lovell	4	United Mexican	1
Great Fortune	⅛	Anglo-Mexican Mint	⅛
Great East Lovell	⅛	Port Phillip	¼
Marke Valley	¼	Montes Aurcos	⅛
East Russell	1¼	Vallanzasca	¼
Clifford Amalgamated	4	Gellivara	2½
Wheal Seton	5	General	2¾
Camborne Vean	1	Panulcillo	¼
Great Laxey	3¼	Scottish Australian	⅛
Rhymney Iron	⅛	Mariquita	⅛
St. John Del Rey	8	Don Pedro North Del Rey	⅛
Cape Copper	1¾	Fortuna	¼

Declined.

North Shepherds	£½	Lady Bertha	6*s.*
Mary Ann	2½	Drakewalls	£2
Chiverton Moor	⅜	Nanjiles	6½
Mineral Bottom	1¼	St. Day United	¼
Prosper United	⅛	North Roskear	1
East Caradon	3	Wheal Harriet	⅜
East Grenville	2	South Condurrow	⅛
Wheal Grenville	⅜	Carn Camborne	⅜
Wheal Basset	2½	South Darren	⅜
North Basset	12*s.*	Millwall Ironworks	¼
West Basset	1½	Linares	⅜
South Frances	5	Quebrada	⅜
North Downs	½	Yudanamutana	¼

Among Cornish lead mines an effort has been made during the month to push up the quotations of *West Chiverton* shares but without effect. They opened on the 2nd at 60*l.*-65*l.*, and were rapidly run up to 70*l.*-75*l.*, which is the quoted price of the 8th. Since then, however, they have gradually dwindled and close heavy at last month's quotation 60*l.*-62*l.* *Wheal Chiverton* shares are better at 6½*l.*-7*l.* *North Shepherds*, 2¾*l.*-3¼*l.* *Herodsfoot*, 36*l.*-38*l.* *Wentworth Consols*, 7⅛*l.*-8½*l.* *Wheal Trelawny*, 19*l.*-20*l.* *Wheal Mary Ann* shares have gone back to 13*l.*-14*l.* *North Chiverton*, 2⅛*l.*-2½*l.* *Chiverton Moor*, 2¼*l.*-2⅝*l.* *Mineral Bottom* shares (last quoted in September) have receded to 3*l.*-3½*l.* *Frank Mills*, 5*l.* to 5½*l.*

East Lovell shares have had a good rise during the month. They opened at 11¼*l.*-11⅝*l.*, and steadily advanced until the 19th, when they were quoted 16*l.*-16½*l.* From this they gradually relapsed, with slight fluctuations, to their closing price of 15¼*l.*-15½*l.* *Great Wheal Vor* shares opened dull at 34*l.*-34½*l.*, and were flat until the 8th, when they were quoted 32*l.*-33*l.* After this they revived slightly, and have since fluctuated between 32*l.*-33*l.* and 34*l.*-34½*l.* at which they close firm. *Wheal Margaret*, 8¾*l.*-9*l.* *Sithney Metal*, 1½*l.*-2*l.* *Providence*, 36*l.*-38*l.* *Great Wheal Fortune*, 8*l.*-9*l.* *East Vor*, 1½*l.*-2*l.* *Great East Lovell*, 2¼*l.*-3*l.* *South Lovell*, 1¾*l.*-2*l.* *West Vor*, 1¾*l.*-2*l.* *St. Ives Wheal Allen*, 1*l.*-2*l.* *Prosper United*, 2¾*l.*-3*l.*

East Caradon shares have again declined considerably. During the first week they were very heavy, and on the 7th had gone back to 17½*l.*-18½*l.*, the lowest price of the month. A slight reaction, however, took place, and prices went up to 19*l.*-19½*l.* on the 16th; but since that

date, shares have been considerably depressed, and have steadily receded to 18*l.*-19*l.* at which they close heavy. *Marke Valley* shares have gone up from 4*l.*-4¼*l.* to 4¾*l.*-5*l.* *West Caradon*, 6*l.*-7*l.* *South Caradon*, 535*l.* *West Sharp Tor*, 50*l.*-55*l.*

East Grenville shares have steadily receded all through the month closing at 5¼*l.*-5½*l.* *Wheal Grenville* shares have also slightly gone back to 4¼*l.*-5¼*l.* *East Basset*, 50*l.*-52*l.* *Wheal Basset*, 87½*l.*-90*l.* *North Basset*, 21*s.*-23*s.* *West Basset*, 7½*l.* *South Frances*, 20*l.*-30*l.* *East Carn Brea*, 6¾*l.* *North Downs*, 12*s.* 6*d.*

East Russell shares have been better and have gone up to 5½*l.*-6*l.*, at which they close firm. *New Martha*, 1⅝*l.*-1⅝*l.* *Lady Bertha*, 7*s.* 6*d.*-10*s.* *Wheal Crebor*, 1½*l.*-1⅝*l.* *Drakewalls* shares (last quoted in August) 12*s.* 6*d.*-15*s.* *Kelly Bray*, 10*s.*-12*s.* 6*d.* *Hingston Down*, 4¼*l.*-4⅝*l.* *Bedford United*, 2¼*l.*-2½*l.* *Wheal Arthur*, 5*s.*-10*s.* *New Birch Tor and Vitifer*, 2¼*l.*-2½*l.*

Clifford Amalgamated shares have improved 4*l.* They opened at 30*l.*-31*l.* and steadily advanced till the 21st when they were firm at 34*l.*-35*l.* but close slightly lower at 33½*l.*-34½*l.* A considerable business has been done in *Hallenbeagle* shares at 3½*l.*-3¾*l.* *Nanjiles* shares have again heavily gone back, closing at 18*l.*-18¾*l.* *North Treskerby*, 2¼*l.*-2½*l.* *Great Wheal Busy*, 2*l.*-2½*l.* *St. Day United*, 25*s.* 30*s.*

Wheal Seton, 195*l.*-205*l.* *West Seton*, 205*l.*-210*l.* *West Tolgus*, 60*l.*-65*l.* *North Roskear* shares have again slightly declined to 17½*l.*-18½*l.* *Tincroft*, 16*l.*-17*l.* *Wheal Crofty*, 2½*l.*-3*l.* *Wheal Harriett*, 20*s.* 25*s.* *Camborne Vean* 2½*l.*-3*l.* *South Condurrow*, 1⅝*l.*-1⅝*l.* *Carn Camborne*, 1¼*l.*-1⅝*l.*

Among Welsh and Isle of Man mines, *Great Laxey* shares have again improved considerably closing at 19¾*l.* *Vale of Towy*, 4*s.*-6*s.* *South Darren*, 1⅝*l.*-1⅝*l.* *Cambrian Gold*, 5*s.*-7*s.* 6*d.*

There has been very little doing in the shares of the Iron Companies. *Ebbw Vale* were last quoted at 4¼*l.* *Millwall Iron Works*, 4*l.* *Rhymney Iron*, 28½*l.*

There has been a good business done in foreign and colonial mine shares at generally higher prices. *St. John Del Rey* shares have rallied to some extent from last months' decline. On the 15th they had advanced as high as 35*l.*, but close slightly lower at 34½*l.* *Cape Copper* shares have improved from 8⅝*l.* to 10¼*l.*-10½*l.*; and *Cobre* from 27¾*l* to 28½*l.* *United Mexican* better at 5½*l.*; and *Anglo-Mexican Mint* at 19*l.* *Port Phillip* shares have also improved to 1⅝*l.* *Montes Auroes* slightly higher at 1⅝*l.*; and *Vallanzasca* at 1¾*l.* *Gellivara* shares, which were last quoted in July at 1¼*l.*-1½*l.*, have jumped up to 4*l.* *General Mining Association* shares have gone up 2¾*l.*, to 26*l.* *Panulcillo* likewise better at 1¾*l.* *Scottish Australian*, *Mariquita*, and *Don Pedro North del Rey* are each ½*l.* better at ⅝*l.* *Fortuna* is ¼*l.* higher at 3½*l.* *Santa Barbara* ½*l.* *English and Australian* Copper 1½*l.* *East del Rey* ⅝*l.* *Alamillos* 1¼*l.* *Nova Scotia Gold and Land* (new) ⅝*l.* *Alten* 2½*l.*-3*l.* Only three foreign mines have receded: *Linares* to 5½*l.*; *Quebrada* to 3½*l.*; and *Yudanamutana* to 1¾*l.*

On the 14th, the Committee of the Stock Exchange appointed the 17th as a special settling day in the shares of the Aberaman Ironworks, limited, for transactions entered into on and after September 6th. A quotation in the official list is not asked for.

CORNWALL.—The slight improvement which took place in the mining share market at the end of October has been maintained all through November, owing to the more easy tone of the money market, *East Grenville* shares have dropped to 6*l.* *Cook's Kitchen* 11½*l.*-12½*l.* *East Basset* shares close weak at 50*l.*-51*l.* *West Seton*, 207½*l.*-212½*l.*

Carn Camborne, 1⅜*l.*-1½*l.* *Great Wheal Vor*, 33½*l.*-34*l.* *East Lovell*, 14½*l.* *Providence*, 35*l.*

BIRMINGHAM.—*Muntz Metal*, 1½*l.*-1*l* dis. *Nant Coal*, 7⅜*l.*

LIVERPOOL.—*Santa Barbara*, ⅝*l.* dis. *Mersey Steel and Iron*, ½*l.* pm.

MANCHESTER.—*Stavely Coal and Iron*, 15*l.* pm. *Stavely Coal and Iron New*, 4*l.* pm. *Ebbw Vale*, ¾*l.* dis. *John Brown and Co.*, 15½*l.* pm. *Sheepbridge Coal and Iron*, 2½*l.* pm.

DUBLIN.—In the Irish share market the following have been the quotations: *Mining Company of Ireland*, 27½*l.* *General Mining Company of Ireland*, 4⅜*l.* *Connorree*, 1*l.* *Wicklow Copper*, 13*l.*

NEW YORK, *November* 15*th.*—In the general mining stocks business does not improve, transactions being entirely confined to a few of the better class of Lake Superior copper stocks, to Petroleum stocks, and to Colorado gold stocks.

Coal Stocks.—The following have been the principal quotations:—*American*, $85-$87; *Ashburton*, $21; *Cumberland*, 52½-$53; *Central*, $57; *Pensylvania*, $204; *Union*, $100; *Wyoming*, $45.

Copper Stocks.—Quotations have been as follows:—*Aztec*, $7½; *Bedford*, $1; *Boston*, $3; *Canada*, $1¼-$2; *Central*, $58; *Evergreen Bluff*, $17; *Flint Steel River*, $9; *Huron*, $40; *Indiana*, $7½; *Isle Royal*, $22; *Keweenaw*, $6; *Lafayette*, $3; *Mendota*, $8; *Minesota*, $36; *Norwich*, $5; *Ogima*, $8; *Quincy*, $95; *Rockland*, $19.

Gold Stocks.—The following stocks, which are all Colorado ones, have been the only ones quoted. *Benton*, $1; *Corydon*, $1; *Gunnell*, $3; *New York*, $2¼; *Quartz Hill*, $6.

Iron Stocks.—*Copake*, $3-$5; *French Creek*, $½-$¾; *Teal Lake*, $2.

Lead Stocks.—*Clute*, $1-$1¼; *Macomb*, $2; *Sussex*, $½; *Placentia Bay*, $1½; *Walkill*, $2.

Petroleum Oil Stocks.—These stocks continue in the ascendant and business is daily increasing. The New York Petroleum Stock Exchange was formerly opened on October 31st. The following have been the quotations:—*Brevoort*, $3-$11; *Knickerbocker*, $3; *Commonwealth*, $7-$7½; *Excelsior*, $4-$4½; *Maple Shade, N.Y.*, $8; *Miller Farm*, $4-$4¾; *Noble Well*, $8; *Pit Hole Creek*, $14-$15; *Rynd Farm*, $5½-$6; *Buchanan*, $1-$3; *Germania*, $1½. [*** Quotations in Legal Tender Notes: American Gold, 244%.]

SAN FRANCISCO, *October*, 15*th.*—Leading mining shares have been decidedly more in favour, and prices have generally advanced.

Gould and Curry shares have been dealt in to a large extent and after advancing to $1,850 close at $1,675. *Savage* shares have been in request and have advanced to $1,850. *Yellow Jacket* shares have been attracting attention and 32 feet have changed hands at from $650 to $750. *Chollar* shares have been well maintained, and some feet have been sold at from $870 to $890. *Potosi* shares have advanced to $825. A large business has been done in *Ophir* shares, and a quantity of feet have changed hands at from $360 to $470. *Uncle Sam*, $360. *Hale and Norcross*, $475. *Belcher*, $650. *Imperial*, $149. *Sheba*, $75. *Burning Moscow*, $62. *Wide West*, $30. *Antelope*, $19-$21. *Real del Monte*, $24½-$25. *Golden Age and Empire*, $17-$18. *De Soto*, $18. *Buckeye*, $8. [*** Quotations in Gold: Legal Tender Notes, 51½%.]

ANALYSIS OF BOARD OF TRADE RETURNS.

THE "Accounts relating to Trade and Navigation of the United Kingdom, for the month ended 31st October, and ten months ended 31st October, 1864," give, on analysis, the following results as to the Imports and Exports of Mining, Mineral, and Metallurgical products.

The IMPORTS for the month show a large increase in respect of unwrought copper, silver ore, petroleum, and quicksilver. In unwrought copper the increase has been from Chili from 11,900*l.* to 43,040*l.*, and from Australia from 2,100*l.*, to 26,460*l.*

The EXPORTS for the month show an almost general decrease, the only increase of any importance being on copper wrought of other sorts from 2,790*l.* to 26,627*l.* The diminution in the exports of pig and puddled extended to every market except Holland, the main decrease being to the United States from 19,037*l.* to 2,596*l.* The decrease on bar iron also extended to all markets except Turkey, the principal decrease being to the United States from 51,351*l.* to 13,986*l.* The falling off in railroad iron was general with the exception of to Brazil, the decrease to the United States being from 40,948*l.* to 17,604*l.*, to Australia from 15,897*l.* to 3,215*l.*, to Spain and Canaries from 30,249*l.* to 20,607*l.*, and to Russia from 22,259*l.* to 15,599*l.* In sheet iron the decrease was almost confined to Russia from 38,875*l.* to 8,466*l.* In wrought iron the decrease was principally to Russia from 53,005*l.* to 6,610*l.*, and British India from 33,390*l.* to 13,645*l.* In unwrought copper the falling off has been mainly to France from 61,898*l.* to 9,449*l.* The decrease in tin-plates was almost wholly confined to the United States from 70,677*l.* to 18,444*l.*

IMPORTS.—The quantities and relative increase and decrease of the imports of metals, metallic ores, and mineral products, for the month and ten months ended 31st October, have been as follows:—

	Month ended 31st October.			Ten Months ended 31st October.		
	1863.	1864.	Increase (+) or Decrease (−)	1863.	1864.	Increase (+) or Decrease (−)
Brimstone.....cwt.	102,020	87,130	− 14,890	689,313	706,729	+ 17,416
Copper Ore .....tons	7,161	5,758	− 1,303	65,850	55,520	− 10,330
Copper Regulus ..... „	1,978	1,322	− 656	16,562	20,674	+ 4,112
Copper, unwrought and part wrought .....cwt.	20,000	74,320	+ 54,320	198,580	401,780	+ 203,200
Iron, in Bars, unwrought, tons	7,451	5,751	− 1,700	36,216	39,861	+ 3,645
Steel, unwrought ..... „	277	824	+ 547	2,029	5,598	+ 3,569
Lead, Pig and Sheet ..... „	2,114	1,342	− 772	20,791	25,111	+ 4,320
Spelter or Zinc ..... „	3,049	2,151	− 898	24,182	25,029	+ 847
Tin, in Blocks, Ingots, Bars, or Slabs.....cwt.	2,965	5,816	+ 2,851	37,656	72,757	+ 35,101
Silver Ore .....value in £	7,910	13,654	+ 5,744	198,291	199,713	+ 1,422
Petroleum.....tuns	553	2,042	+ 1,489	30,429	16,365	− 14,064
Pyrites .....tons	15,054	15,644	+ 590	159,061	149,177	− 9,884
Quicksilver ..... lbs.	—	35,032	+ 35,032	1,152,733	3,749,206	+ 2,596,473

EXPORTS.—The quantities, declared value, and relative increase and decrease of the exports of metals, minerals, and metallurgical articles of British and Irish produce and manufactures, for the month and ten months ended 31st October, have been as follows:—

	QUANTITIES.				DECLARED VALUE.					
	Month ended 31st October.		Ten Months ended 31st October.		Month ended 31st October.			Ten Months ended 31st October.		
	1863.	1864.	1863.	1864.	1863.	1864.	Increase (+) or Decrease (−)	1863.	1864.	Increase (+) or Decrease (−)
					£	£	£	£	£	£
Alkali: Soda ..... cwt.	212,528	181,795	1,820,721	1,829,208	82,401	80,186	− 2,215	748,794	766,100	+ 17,306
Coal, Cinders, and Culm ..... tons	844,685	752,078	7,084,014	7,367,993	379,401	358,416	− 20,985	3,147,276	3,458,628	+ 311,352
Iron, Pig and Puddled ..... „	47,821	37,692	413,722	397,914	136,245	112,931	− 23,314	1,131,242	1,215,668	+ 84,426
Iron, Bar, Angle, Bolt, and Rod. „	30,195	18,706	275,281	243,707	253,583	173,383	− 80,200	2,092,251	2,253,494	+ 161,243
Iron, Railroad, of all sorts..... „	33,586	26,157	397,193	349,346	264,462	218,543	− 45,919	2,825,531	2,840,677	+ 15,146
Iron, Cast ..... „	7,250	3,924	71,463	57,505	73,329	50,474	− 22,855	615,580	565,889	− 49,691
Iron Hoops, Sheets, and Boiler Plates ... ... „	15,220	10,493	116,149	105,589	189,237	153,383	− 35,854	1,369,113	1,510,228	+ 141,115
Iron, wrought, of all sorts ... „	11,793	8,170	92,848	89,918	246,320	171,136	− 75,184	1,804,082	1,856,411	+ 52,329
Iron, old, for re-manufacture ... „	1,099	136	12,878	6,148	4,335	615	− 3,720	48,440	29,842	− 18,598
Iron Steel, unwrought ... ... „	2,719	1,660	23,122	23,340	90,175	57,169	− 33,006	747,587	768,668	+ 21,081
Copper, unwrought, in Ingots, Cakes, or Slabs ..... cwt.	21,782	12,138	231,482	97,588	100,835	57,473	− 43,362	1,068,130	485,324	− 582,806
Copper, wrought or partly wrought, Bars, Rods, Bottoms, Pans, Plates, Sheets, and Nails; and mixed or Yellow Metal for Sheathing . „	56,367	56,326	471,199	456,922	262,941	270,198	+ 7,257	2,155,422	2,265,262	+ 109,840
Copper, wrought, of other sorts . „	435	4,329	8,649	18,978	2,970	26,627	+ 23,657	53,126	115,956	+ 62,830
Brass of all sorts ... ... „	5,254	4,696	37,499	34,455	26,755	26,802	+ 47	188,762	191,639	+ 2,877
Lead, Pig, Rolled, Sheet, Piping, Tubing, and Lead Shot ..... tons	2,088	2,499	30,373	30,031	44,697	53,969	+ 9,272	653,519	659,071	+ 5,552
Lead Ore, Lead, Red, and White, and Litharge of Lead ..... „	504	554	5,524	5,742	12,487	13,645	+ 1,158	133,282	146,184	+ 12,902
Tin, unwrought ..... cwt.	10,347	8,297	72,157	78,192	58,532	43,188	− 15,344	420,277	423,154	+ 2,877
Tin Plates ..... „	101,453	63,344	932,514	873,897	120,374	78,084	− 42,290	1,094,271	1,111,217	+ 16,946
Zinc or Spelter, wrought or unwrought ..... „	9,900	8,102	83,525	93,053	10,888	9,508	− 1,380	83,873	99,910	+ 16,037
Salt ..... tons	49,248	53,263	555,223	527,217	22,072	25,043	+ 2,971	256,599	250,170	− 6,429
				£	2,382,039	1,980,773	− 401,266	20,637,157	21,013,492	+ 376,335

Tabular Abstract of Mining Accounts for the Month.

Date of Account.	Name of Mine, and Number of Shares.	Balances. Debit. £ s. d.	Balances. Credit. £ s. d.	Calls. Per Share. £ s. d.	Calls. Total. £ s. d.	Dividends. Per Share. £ s. d.	Dividends. Total. £ s. d.
	CORNISH & DEVON MINES.						
Oct. 24	Camborne Vean (4,600)	2,379 17 4	—	0 10 0	2,300 0 0	—	—
„ 25	Falmouth and Sperries (2,000).	897 0 0	—	0 9 0	900 0 0	—	—
„ 25	Hingston Down (6,000)	—	228 0 0	—	—	—	—
„ 26	North Basset (6,000)	428 0 0	—	0 2 6	750 0 0	—	—
„ 27	Wendron Consols (1,024)	1,353 7 4	—	1 0 0	1,024 0 0	—	—
„ 28	Godolphin (1,024)	55 11 10	—	0 2 6	128 0 0	—	—
„ 28	Wheal Clinton (?)	—	—	1 0 0	?	—	—
„ 28	Wheal Hope (2,048)	504 0 0	—	0 7 6	768 0 0	—	—
„ 28	Gawton (4,000)	267 0 0	—	0 2 0	400 0 0	—	—
„ 31	Wheal Crofty (6,000)	568 3 1	—	0 4 0	1,200 0 0	—	—
„ 31	East Pool (128)	315 7 5	—	—	—	—	—
	Wheal Trannack (1,920)	52 0 0	—	0 1 6	144 0 0	—	—
	East Ellen (1,300)	209 0 0	—	0 3 0	195 0 0	—	—
	Chiverton Valley (3,000)	—	7,763 0 3	—	—	—	—
Nov. 2	Kitty (St. Agnes) (4,295)	—	2,415 0 0	—	—	0 5 0	1,073 15
„ 2	Rosewarne Consols (3,998)	—	712 19 8	—	—	—	—
„ 3	North Downs (6,000)	1,365 13 2	—	0 3 0	900 0 0	—	—
„ 7	Frank Mills (5,000)	—	3,137 14 2	—	—	0 5 0	1,250 0
„ 7	South Frances (496)	—	1,378 15 10	—	—	—	—
„ 8	Crowan Consols (2,500)	—	942 2 0	—	—	—	—
„ 8	Pendeen Consols (5,000))	228 1 5	—	—	—	—	—
„ 8	Bedford Consols (4,000)	399 14 8	—	0 1 0	200 0 0	—	—
„ 8	South Carndon Hooper (4,096).	536 9 2	—	0 3 0	614 8 0	—	—
„ 8	Par Consols (6,400)	670 13 4	—	—	—	—	—
„ 9	New Wheal Rose (4,096)	275 15 6	—	0 2 6	512 0 0	—	—
„ 9	Stray Park (920)	872 3 11	—	1 0 0	920 0 0	—	—
„ 10	New Hendra (400)	108 18 11	—	1 10 0	600 0 0	—	—
„ 10	West Chiverton (3,000)	—	8,197 7 2	—	—	0 15 0	2,250 0
„ 10	Wheal Chiverton (3,000)	—	1,614 0 9	—	—	—	—
„ 10	St. Ives Wheal Allen (900)	594 9 7	—	0 13 0	585 0 0	—	—
„ 10	East Grenville (6,000)	813 9 11	—	0 2 0	600 0 0	—	—
„ 10	Torbay Hematite (1,600)	—	664 8 2	—	—	0 6 0	440 0
„ 12	Hallenbeagle (6,000)	533 17 3	—	0 5 0	1,500 0 0	—	—
„ 14	West Damsel (256)	—	598 0 0	—	—	1 0 0	256 0
„ 14	New East Russell (6,514)	—	97 14 4	0 0 6	162 17 0	—	—
„ 14	Penhallow Moor (512)	1,332 0 0	—	4 0 0	2,048 0 0	—	—
„ 15	Roskearnoweth (700)	—	35 4 3	—	—	—	—
„ 15	North Roskear (700)	1,111 14 11	—	1 10 0	1,050 0 0	—	—
„ 15	E. Devon Great Consols (4,000)	116 11 4	—	0 2 0	400 0 0	—	—
„ 15	Wheal Buller (256)	620 16 0	—	3 0 0	768 0 0	—	—
„ 15	East Margaret (1,024)	932 4 1	—	15 0 0	768 0 0	—	—
„ 15	St. Ives Consols (940)	—	15 0 0	—	—	—	—
„ 16	St. Day United (4,000)	—	619 0 0	—	—	—	—
„ 17	Wheal Crebor (6,000)	—	425 10 4	0 1 6	450 0 0	—	—
„ 17	North Jane (6,000)	—	332 7 1	—	—	—	—
„ 17	Wheal Par (1,024)	656 17 0	—	0 10 0	512 0 0	—	—
„ 18	Wheal Owles (80)	—	1,448 0 11	—	—	—	—
„ 18	Wheal Norris (6,000)	1,087 6 0	—	0 3 0	900 0 0	—	—
„ 18	Botelet (1,024)	163 11 9	—	0 7 6	384 0 0	—	—
„ 19	East Chiverton (2,000)	555 12 7	—	0 7 6	750 0 0	—	—
„ 21	Emily Henrietta (1,024)	473 19 4	—	0 10 0	512 0 0	—	—
„ 21	Wheal Arthur (5,790)	880 10 9	—	0 5 0	1,447 10 0	—	—
„ 21	Cargoll (916)	—	1,060 17 10	—	—	—	—
„ 21	West Vor (4,096)	—	1,150 0 0	—	—	—	—
„ 22	Great Work (119)	—	609 0 0	—	—	—	—
„ 22	South Tolgus (512)	—	60 0 0	—	—	—	—
„ 22	South Carn Brea (6,000)	841 16 0	—	0 4 0	1,200 0 0	—	—
„ 22	South Hingston (?)	125 0 0	—	0 3 0	?	—	—
„ 22	Wheal Curtis (1,000)	1,250 0 0	—	1 5 0	1,250 0 0	—	—
„ 23	Gurlyn (4,910)	697 16 9	—	0 5 4	1,235 16 8	—	—
„ 23	New Crow Hill (6,400)	335 13 1	—	0 1 0	320 0 0	—	—
„ 23	West Basset (6,000)	—	1,965 10 3	—	—	0 5 0	1,500 0
„ 25	Devon Great Consols (1,024)	—	36,078 7 2	—	—	10 0 0	10,240 0
					28,398 11 8		17,009 15
	WELSH & OTHER MINES.						
Oct. 26	Alderley Edge (1,200)	—	—	—	—	0 15 0	900 0
„ 29	Wicklow Copper (7,000)	—	—	—	—	0 6 0	2,100 0
Nov. 19	Minera Boundary (3,000)	—	—	—	—	0 2 0	300 0
	FOREIGN MINE.						
Nov. 8	United Mexican (43,174)	—	2,948 1 8	—	—	—	—

Copper Ores.

Sampled October 19, and sold at Tabb's Hotel, Redruth, November 3.

Mines.	Tons.	Purchasers.	Price.
Clifford Amalgamated	98	4, 6	£4 5 6
	90	4, 6	3 18 0
	86	4, 6	2 17 0
	76	1, 5	10 9 6
	75	1, 5	10 12 6
	74	9	4 16 6
	52	6, 9	3 4 6
	47	2	4 7 0
	44	6	9 16 0
	39	1, 12	2 3 6
(Consols)	49	1	8 8 6
West Seton	75	2, 11	6 14 6
	68	1	8 10 6
	67	3	4 19 6
	66	6, 9	4 13 0
	59	8	2 17 6
	54	7	7 5 0
	52	7	4 7 0
	29	7	7 14 0
Wheal Seton	37	11	4 2 0
	23	12	1 6 0
(Pendarves)	87	2	3 18 0
	61	3	7 11 6
	52	3	7 2 0
	47	10	1 1 0
	41	2, 3, 11	3 17 6
	6	2	2 0 0
South Tolgus	70	3	5 12 6
	60	3	6 15 6
	55	4, 6	3 13 0
	45	5	3 13 6

Mines.	Tons.	Purchasers.	Price.
North Roskear	74	13	£6 12 6
	70	3, 7	9 6 0
	61	5	2 16 0
East Grenville	71	1, 9, 10	2 4 0
	56	12	2 2 6
	39	9, 11	6 9 0
	21	5	5 1 0
	10	12	2 0 6
Tolcarne	51	10	3 16 6
	46	9	3 7 0
	42	12	1 18 6
	33	7	4 8 0
East Pool	67	10	4 4 6
	56	6, 9	4 6 0
	44	2, 6	3 14 6
South Frances	51	4, 6	4 6 6
	44	5	4 0 0
	27	4, 6	7 7 6
	2	8	29 10 6
Wheal Basset	66	10	4 9 6
	37	1	8 1 0
	20	1, 5	23 3 0
Nanjiles	52	7	5 5 6
	27	5	4 5 6
	23	7	2 7 0
East Basset	38	1, 10	6 14 0
	26	3	7 8 0
	25	1	5 6 6
Wheal Grenville	35	6	10 6 6
West Stray Park	31	2, 6	6 17 6
South Condurrow	20	1	11 17 6

TOTAL PRODUCE AND VALUE.

	Tons.	Amount.
Clifford Amalgamated	730	£4,716 1 6
West Seton	470	2,734 18 6
Wheal Seton	354	1,572 8 0
South Tolgus	230	1,166 7 6
North Roskear	205	1,312 1 0
East Grenville	197	653 1 0
Tolcarne	172	575 4 6
East Pool	167	687 15 6

	Tons.	Amount.
South Frances	124	£676 15 0
Wheal Basset	123	1,056 4 0
Nangiles	102	443 15 6
East Basset	89	580 2 6
Wheal Grenville	35	361 7 6
West Stray Park	31	213 2 6
South Condurrow	20	237 10 0

EACH COMPANY'S PURCHASE.

	Tons.	Amount.
1 Vivian & Sons	346½	£2,910 15 4
2 Freeman & Co.	229½	1,049 8 2
3 Grenfell & Sons	384½	2,535 14 2
4 Crown Copper Co.*	—	—
5 Sims, Willyams, & Co.	283½	1,783 12 9
6 Williams, Foster, & Co.	610½	3,424 5 9
7 Mason & Elkington	278	1,643 1 0
8 Bankart & Sons	61	228 13 6
9 Copper Miners' Co.	250½	£1,046 13 10
10 Charles Lambert	273½	1,002 4 4
11 Newton, Keates, & Co.	107½	582 12 5
12 Sweetland, Tuttle, & Co.	150½	292 8 3
13 Penclawdd Copper Co.	74	490 5 0
Total	3,049	16,986 14 6

Average Produce, 7 °/₀.
Quantity of Fine Copper, 212 tons 14 cwt.
Ore required to make a ton of Fine Copper, 14 tons 6 cwts. 2¼ qrs.

Average Price per ton of Ore £5 11 5
Per Unit of Copper in Ore..... 0 15 11¼
Average Standard (nominal) 119 5 0

Sundry Copper Ore Sales.

Dates.	Mines.	Tons.	Price per ton. £ s. d.	Purchasers.	Amount of Money. £ s. d.
Nov. 8.	Great Laxey	120	... 4 4 0	... Pocket Nook Co.	504 0 0
„ 15.	Parys (copper ore)	125	... 6 19 0	... J. Keys & Son	2,028 10 0
	„	125	... 6 19 0	... Mona Co.	
	(copper precipitate)	30	... 7 5 6	... ditto	
	„	10	... 7 5 6	... Sims, Willyams, & Co.	

* The purchases made by No. 4 (Crown Copper Co.) are included in the total of No. 6 (Williams Foster, & Co.); those firms being identical.

Copper Ores.

Sampled October 26, and sold at Tabb's Hotel, Redruth, November 10.

Mines.	Tons.	Purchasers.	Price.
Wheal Margery	95	12	£2 8 0
	75	6	2 7 6
	74	8	2 15 0
	64	1, 6	6 12 6
	61	1	6 4 6
	60	6	6 1 6
East Carn Brea	75	11	6 17 6
	70	2, 7	4 6 0
	42	10	4 6 0
	38	7	6 3 6
	23	7	3 16 0
	22	7	6 19 9
	21	7	6 8 6
Prosper United.....	90	1, 5	1 17 6
	84	9, 13	4 16 6
	57	9, 10	2 11 0
	52	5	4 11 0
	27	5	2 16 0
West Basset	65	1	5 13 6
	56	5	10 5 0
	54	4, 6	5 18 6
	51	10	3 14 6
	28	1, 2	12 5 0
	19	8	4 10 6
Levant	92	13	6 1 6
	68	5	6 13 0
	28	1	1 8 6
	22	8	3 16 6
East Rosewarne	50	1, 6	9 10 0
	32	11	7 15 0

Mines.	Tons.	Purchasers.	Price.
East Rosewarne	31	1, 6	£13 7 6
	27	9	2 14 6
	23	9	2 16 0
Treloweth	59	4, 6	4 15 6
	49	4, 6	5 5 6
	38	2	5 5 6
	14	10	2 9 6
Par Consols	101	2, 3, 6	6 8 0
Tolvadden.....	45	10	2 19 6
	44	8	4 4 6
	3	3	16 11 6
Wheal Buller	64	10	1 18 0
	22	2	4 14 6
Copper Hill	54	12	1 16 0
	21	7	6 15 6
Boscaswell	70	7	5 15 6
New Rosewarne	69	7, 11	6 14 0
Botallack	24	1	6 19 6
	20	5	6 18 0
Wheal Trannack	38	1, 5	4 16 6
	4	1, 5	5 16 6
North Basset	40	9	3 17 6
Wheal Curtis	24	5	2 8 0
	8	1	5 19 6
Wheal Unity	11	2	2 13 6
	7	1	6 11 0
Providence	16	1	7 18 0
Emily Henrietta	12	3	4 7 0
Alfred Consols	10	3	4 15 6
Pembroke	2	12	2 13 0

TOTAL PRODUCE AND VALUE.

	Tons.	Amount.
Wheal Margery	429	£1,777 17 0
East Carn Brea	321	1,779 13 0
Prosper United.....	310	1,081 12 0
West Basset.....	273	1,881 15 6
Levant	210	1,135 3 0
East Rosewarne	163	1,486 12 0
Treloweth.....	160	775 6 0
Par Consols	101	646 8 0
Tolvadden.....	92	369 10 0
Wheal Buller	86	225 11 0
Copper Hill	75	239 9 6

	Tons.	Amount.
Boscaswell.....	70	£404 5 0
New Rosewarne	69	462 6 0
Botallack	44	305 8 0
Wheal Trannack	42	206 13 0
North Basset	40	155 0 0
Wheal Curtis	32	105 8 0
Wheal Unity Consols.....	18	75 5 6
Providence	16	126 8 0
Emily Henrietta	12	52 4 0
Alfred Consols	10	47 15 0
Pembroke	2	5 6 0

EACH COMPANY'S PURCHASE.

	Tons.	Amount.
1 Vivian & Sons	361¼	£2,191 19 3
2 Freeman & Co.....	153¾	871 5 10
3 Grenfell & Sons	58¾	365 2 10
4 Crown Copper Co.*.....	...	—
5 Sims, Willyams, & Co...	313	1,721 14 0
6 Williams, Foster, & Co.	403¼	2,275 1 1
7 Mason & Elkington ...	294¼	1,710 12 0
8 Bankart & Sons	159	559 10 6

	Tons.	Amount.
9 Copper Miners' Co. ...	160¾	£729 6 0
10 Charles Lambert	244¼	733 7 6
11 Newton, Keates, & Co	141¾	994 15 6
12 Sweetland, Tuttle, & Co.	151	330 10 0
13 Penclawdd Copper Co..	134	761 11 0
Total.....	2,575	13,244 15 6

Average Produce, 6¼ °/₀.
Quantity of Fine Copper, 167 tons 5 cwts.
Ore required to make a ton of Fine Copper, 15 tons 7 cwts. 3¾ qrs.

Average Price per ton of Ore £5 2 10¾
Per Unit of Copper in Ore 0 15 10
Average Standard (nominal)..... 121 10 0

* The purchases made by No. 4 (Crown Copper Co.) are included in the total of No. 6 (Williams Foster, & Co.) those firms being identical.

Copper Ores.

Sampled November 2, and sold at the Royal Hotel, Truro, November 17.

Mines.	Tons.	Purchasers.	Price.
Devon Great Consols.	130	2, 6, 9, 10	£3 2 0
	129	9	4 4 0
	123	11	5 4 6
	122	10	4 2 6
	119	4, 6, 10	3 11 6
	117	7	4 16 0
	116	3	5 2 6
	115	4, 6	4 14 6
	110	3	4 5 6
	108	9	4 3 0
	106	9	4 8 0
	105	8	3 14 0
	104	5	2 15 0
	102	5	4 15 0
	101	12	2 5 0
	100	8, 12	3 14 0
	96	5, 7	5 1 0
	83	8	4 9 6
	48	2	5 3 6
	41	5	13 1 0
	11	12	2 10 6
New Wheal Martha...	92	1, 5	1 11 6
	85	1, 5	1 13 6
	79	1, 5	1 14 0
	78	1, 5	1 16 0
	70	1, 5	2 11 6
	57	1, 5	2 8 6
	56	1, 5	1 19 0
	43	1, 5	2 4 0
	34	1, 5	1 16 0
Hingston Down	95	2, 3, 6	4 15 6
	90	9	2 13 0
	86	9	2 14 0
	85	9	2 13 6

Mines.	Tons.	Purchasers.	Price.
Hingston Down	84	2, 6, 9	£3 9 0
	41	3	10 11 6
East Caradon	89	4, 6	3 13 0
	82	10	3 12 0
	78	4, 6	5 3 6
	77	10	3 12 0
	76	2	3 12 6
	68	6	3 19 0
Marke Valley	86	1	3 4 6
	84	4, 6	4 4 6
	82	1	3 8 6
	81	1	3 12 0
	42	3	7 1 6
	35	12	1 6 0
	20	5	2 0 0
Bedford United	97	4, 6, 13	4 9 6
	81	3, 9	4 14 0
Wheal Emma	59	8	3 1 6
	57	1, 5	1 11 6
	56	1	2 13 6
East Russell	73	2	4 1 0
	55	13	3 16 0
	37	13	6 0 0
Wheal Friendship ...	97	8	3 5 6
	47	1	9 4 6
Wheal Crebor	87	4, 6	5 10 0
	37	8, 9, 13	4 18 6
Wheal Arthur	56	12	2 14 0
	53	7	2 18 0
Wheal Edward.....	45	2, 10	2 8 6
	22	2	5 9 6
Cargoll	48	1	15 17 6
	12	1	1 15 6
Fursdon.....	30	9	3 0 0

TOTAL PRODUCE AND VALUE.

	Tons.	Amount.
Devon Great Consols.....	2,086	£9,024 8 6
New Wheal Martha	594	1,145 9 0
Hingston Down	481	1,875 1 6
East Caradon	470	1,845 0 0
Marke Valley	430	1,587 7 0
Bedford United	178	814 15 6
Wheal Emma	172	421 0 0

	Tons.	Amount.
East Russell	165	£726 13 0
Wheal Friendship	144	751 5 0
Wheal Crebor	124	660 14 6
Wheal Arthur.....	109	304 18 0
Wheal Edward	68	235 1 0
Cargoll	60	788 6 0
Fursdon	30	90 0 0

EACH COMPANY'S PURCHASE.

	Tons.	Amount.
1 Vivian & Sons	737½	£2,834 1 9
2 Freeman & Co.....	334½	1,348 11 11
3 Grenfell & Sons	381½	2,137 0 8
4 Crown Copper Co.*.....	—	—
5 Sims, Willyams, & Co..	640½	2,205 11 3
6 Williams, Foster, & Co.	757½	3,295 8 8
7 Mason & Elkington ...	218	957 14 0
8 Bankart & Sons	406½	1,504 15 4

	Tons.	Amount.
9 Copper Miners' Co. ...	747½	£2,692 18 4
10 Charles Lambert	375½	1,372 15 5
11 Newton, Keates, & Co.	123	642 13 6
12 Sweetland,Tuttle,&Co.	253	636 14 6
13 Penclawdd Copper Co..	136½	636 8 8
Total	5,111	£20,264 14 0

Average Produce, 5 %.
Quantity of Fine Copper, 255 tons 2 cwts.
Ore required to make a ton of Fine Copper, 20 tons 0 cwts. 2¾ qrs.

Average Price per ton of Ore £3 19 3½
Per Unit of Copper in Ore 0 15 10½
Average Standard (Nominal) 134 11 0

* The purchases made by No. 4 (Crown Copper Co.) are included in the total of No. 6 (Williams Foster, & Co.), those firms being identical.

Copper Ores.

Sampled November 9, and sold at Tabb's Hotel, Redruth, November 24.

Mines.	Tons.	Purchasers.	Price.
Clifford Amalgamated	81	5	£1 17 6
	80	7	4 17 6
	65	5	1 19 6
	63	12	2 3 6
	62	10	1 19 6
	56	12	1 10 6
	54	5	6 13 6
	53	9	3 18 0
	35	5, 7	6 1 0
	12	12	4 4 0
Wheal Rose	108	9	2 18 0
	107	2, 6, 7	4 14 0
	95	9	3 3 0
	80	6, 11	5 17 0
	65	2, 9, 11	4 9 0
	61	7	9 7 0
	44	2	4 16 0
South Caradon	79	13	8 7 0
	78	13	8 7 0
	72	2	5 8 6
	70	1, 5, 6	15 3 6
	58	1	19 5 6
	57	7, 11	5 8 0
	37	1, 6	14 7 6
Phœnix Mines	76	8	3 3 6
	72	5	2 10 6
	68	4, 6	3 15 6
	62	12	1 12 6
	51	4, 6	3 8 0
	37	4, 6	6 12 6
North Treskerby	70	6	£4 16 6
	65	3	4 12 6
	57	3	3 8 0
	56	3	3 18 6
	54	3	3 5 6
	48	3, 7	3 12 6
West Caradon	74	1	6 7 6
	72	6	4 17 6
	65	6	5 4 6
	53	10	4 2 6
	21	5, 7, 10	4 3 0
Great Wheal Busy	40	1	0 13 6
	34	7	3 2 6
	33	4, 6	3 0 6
	30	12	2 5 6
	26	8	2 3 6
	19	3	2 1 0
Boscawen	78	8	2 0 0
	22	3	7 9 0
Wheal Polmear	60	5	5 2 0
	33	5	4 9 0
Gonamena	50	9	3 6 6
	39	8	2 14 0
North Downs	41	6	6 5 0
	40	7, 11	5 6 6
Molland	45	1	4 10 0
South Crinnis	42	8	3 7 6
East Downs	24	2	5 4 6
East Treskerby	10	1	9 3 6
Creegbrawse	8	6	3 8 0

TOTAL PRODUCE AND VALUE.

	Tons.	Amount.
Clifford Amalgamated	561	1,844 8 6
Wheal Rose	560	2,554 3 0
South Caradon	451	4,721 8 6
Phœnix	366	1,199 1 6
North Treskerby	350	1,402 16 6
West Caradon	285	1,468 3 0
Great Wheal Busy	182	396 16 6
Boscawen	100	319 18 0
Wheal Polmear	93	£452 17 0
Gonamena	89	271 11 0
North Downs	81	469 5 0
Molland	45	202 10 0
South Crinnis	42	141 15 0
East Downs	24	125 8 0
East Treskerby	10	91 15 0
Creegbrawse	8	27 4 0

EACH COMPANY'S PURCHASE.

	Tons.	Amount.
1 Vivian & Sons	268 5-6	£2,533 19 5
2 Freeman & Co.	197½	991 5 0
3 Grenfell & Sons	297	1,180 18 6
4 Crown Copper Co.*	—	—
5 Sims, Willyams, & Co..	412 5-6	1,764 7 2
6 Williams, Foster, & Co.	562½	3,108 10 7
7 Mason & Elkington	307½	1,716 11 2
8 Bankart & Sons	261	700 18 0
9 Copper Miners' Co.	327½	£1,081 16 6
10 Charles Lambert	122	370 2 4
11 Newton, Keates, & Co.	110½	590 16 6
12 Sweetland, Tuttle, & Co.	223	441 16 0
13 Penclawdd Copper Co.	157	1,310 19 4
Total	3,247	£15,789 0 6

Average Produce, 6 1/16 %.
Quantity of Fine Copper, 196 tons 10 cwts.
Ore required to make a ton of Fine Copper, 16 tons 10 cwts. 2 qrs.

Average Price per ton of Ore..... £4 17 3
Per Unit of Copper in Ore 0 16 0½
Average Standard (nominal)..... 125 16 0

Blende Sales.

Dates.	Mines.	Tons.	Price per ton. £ s. d.	Purchasers.	Amount of Money. £ s. d.
Oct. 28.	Cargoll	85	... 4 14 6	— —	401 12 6
Nov. 1.	Talargoch	140	... 4 2 0	Vivian & Son	635 15 0
	"	26	... 2 7 6	ditto	
" 4.	Minera	130	... 4 7 0	Vivian & Sons	893 2 6
	"	20	... 4 11 6	W. Kenrick	
	"	10	... 3 5 9	ditto	
	"	12	... 4 15 0	H. Southern	
	"	30	... 4 17 6	Vivian & Sons	
" 8.	Great Laxey	200	... 3 15 9	W. Kenrick	757 10 0
" 23.	"	200	... 3 8 6	Vivian and Co.	685 0 0

* The purchases made by No. 4 (Crown Copper Co.) are included in the total of No. 6 (Williams Foster, & Co.), those firms being identical.

Copper Ores.

Sampled October 19, and sold at Swansea, November 8.

Mines.	Tons.	Produce.	Purchasers.	Price.
Berehaven	119	9¼	6	£8 4 0
„	101	9¼	1	8 0 6
„	111	9¼	1	8 2 6
„	88	10	9	8 8 0
„	80	10	5, 7, 9, 13	8 7 6
„	35	9¼	7	8 1 6
„	48	10¼	7	9 3 6
„	123	11¼	3	9 8 0
„	100	10¼	7	8 10 6
Chili ore	76	15⅝	3	13 12 0
„	76	16	1	13 13 0
„	39	35¾	7	30 11 6
„	74	15¼	6	13 13 0
„	69	15¼	1, 9	13 4 0
„	62	16	1	13 11 6
„	38	36¼	5, 9	30 18 6
„	57	15¾	15	13 10 0
„	52	15¼	2	13 6 6
Chili ore	38	36½	5	£31 3 6
Leghorn	65	8¼	6	7 6 0
„	48	8¼	6	7 6 0
New Cornwall	44	19¾	10	17 1 6
British Regulus	35	23¼	10	19 10 6
Copper slag	6	7¼	5	5 0 0
Cronebane	25	2¼	7	1 4 0
„	14	3¼	7	2 10 0
London ore	5	13¾	7	11 15 6
Tigrony	3	5¼	7	3 18 0
(Precipitate)	1	15¼	10	12 5 6
Cronebane	1	15¼	6	12 13 0
Gwalla ore	1	29¼	7	25 10 0
„	1	36¼	7	31 5 0
„	6	15¼	7	12 17 6
Precipitate	3	58¼	5	49 0 0
Australian ore	2	30¼	7	26 1 6
Kanmantoo	21	50¼	10	42 12 6

TOTAL PRODUCE AND VALUE.

	Tons.	Amount.
Berehaven	805	£6,829 2 6
Chili ore	581	9,848 3 6
Leghorn	113	824 18 0
New Cornwall	44	751 6 0
British Regulus	35	683 7 6
Copper slag	6	30 0 0
Cronebane	39	65 0 0
London ore	5	£58 17 6
Tigrony	4	23 19 6
Cronebane	1	12 13 0
Gwalla ore	3	134 0 0
Precipitate	3	147 0 0
Australian ore	2	52 3 0
Kanmantoo	21	895 2 6

EACH COMPANY'S PURCHASE.

	Tons.	Amount.
1 Copper Miners' Co.	384½	£4,046 17 0
2 Freeman & Co.	52	692 18 0
3 Grenfell & Sons	199	2,189 16 0
4 Crown Copper Co.	—	—
5 Sims, Willyams, & Co.	86	2,116 14 6
6 Vivian & Sons	307	2,823 9 0
7 Williams, Foster, & Co.	299	3,257 3 6
8 British & For. Copper Co.	—	—
9 Mason & Elkington	161½	1,949 13 6
10 Bankart & Sons	101	2,342 1 6
11 Charles Lambert	—	—
12 Ravenhead Copper Co.	—	—
13 Sweetland, Tuttle, & Co.	20	167 10 0
14 Jennings & Co.	—	—
15 Penclawdd Copper Co.	57	769 10 0
16 Mona Copper Co.	—	—
Total	1,667	£20,355 13 0

Price per Unit of Copper in British and Irish Ores, 16*s.* 8*d.*
British and Irish Ore required to make a ton of Fine Copper, 9 tons 10 cwts. 3½ qrs.

Price per Unit of Copper in Foreign and Colonial Ores, 16*s.* 10½*d.*
Foreign and Colonial Ore required to make a ton of Fine Copper, 5 tons 4 cwts. 3½ qrs.

NO SALE ON NOVEMBER 29.

Black Tin Sales.

Dates.	Mines.	Tons. c.	q. lbs.	Price per ton.	Purchasers.	Amount of Money.
Sept. 17.	Wheal Par	3 8	1 3 ..	63 2 6	Redruth Co.	£389 17 0
Oct. 19.	„	2 14	0 19 ..	64 7 6	ditto	
„ 26.	Furze Hill Wood	7 16	2 18 ..	£61 5 0	— —	479 15 5
„ 27.	Pedn-an-drea United	7 2	1 2 ..	—	Carvedras	432 14 9
„ 29.	Phœnix	12 11	1 22 ..	56 1 3	Redruth Co.	771 9 7
	„	1 15	3 4 ..	37 5 0	ditto	
Nov. 1.	Wheal Kitty	22 3	1 11 ..	—	— —	1,319 18 1
„ 2.	Great Wheal Busy	14 12	3 15 ..	—	— —	779 19 5
„ 3.	Prosper United	8 1	3 19 ..	58 0 0	Bolitho & Sons	552 15 0
	„	1 16	2 8 ..	45 10 0	ditto	
„ 4.	Cornubia	4 4	3 1 ..	63 0 0	Daubuz & Co.	266 19 10
„ 16.	Wheal Par	3 9	0 1 ..	61 17 6	Redruth Co.	213 9 11
„ 17.	Great Wheal Vor	11 1	3 25 ..	65 0 0	Chyandour	3,278 11 11 including 13*s.* extra carriage.
	„	1 13	2 1 ..	56 0 0	ditto	
	„	10 18	2 8 ..	65 0 0	Treloweth	
	„	1 13	1 11 ..	56 5 0	ditto	
	„	11 2	0 5 ..	65 0 0	Mellanear	
	„	1 17	3 2 ..	56 0 0	ditto	
	„	11 4	1 24 ..	65 0 0	Trereife	
	„	1 15	2 26 ..	56 0 0	ditto	
„ 24.	Wheal Grenville	10 17	0 7 ..	62 0 0	Bissoe Co.	808 6 9½
	„	2 14	0 25 ..	50 0 0	ditto	

Lead Ore Sales.

Dates.	Mines.	Tons.	c.	q.	lbs.	Price per Ton. £	s.	d.	Purchasers.	Amount of Money. £	s.	d.
Oct. 31.	Wheal Frank Mills	90	0	0	0	17	16	6	Treffry's Trustees	3,329	15	0
	"	70	0	0	0	13	14	0	R. Michel & Sons			
	"	60	0	0	0	12	15	6	Treffry's Trustees			
Nov. 1.	Maesyasin	140	0	0	0	13	18	6	Walker, Parker, & Co.	1,949	10	0
" 2.	Minera Union	30	0	0	0	13	13	0	Brymbo Co.	705	0	0
	Twelve Apostles	20	0	0	0	12	17	6	J. Hughes			
	"	4	0	0	0	7	0	0	ditto			
	"	2	0	0	0	5	0	0	ditto			
" 4.	Dyliffe	76	0	0	0	13	16	0	Walker, Parker, & Co.	1,597	16	0
	"	40	0	0	0	13	14	6	A. Eyton			
	Dyfngwm	4	10	0	0	13	2	6	Walker, Parker, & Co.	59	1	3
	Nant-y-Iago	13	0	0	0	12	13	6	ditto	164	15	6
	Sardinian	55	0	0	0	15	18	0	ditto	847	0	0
	Minera	100	0	0	0	14	1	6	Mining Co. of Ireland	6,609	10	0
	"	100	0	0	0	14	0	6	Walker, Parker, & Co.			
	"	100	0	0	0	14	0	6	ditto			
	"	47	0	0	0	14	0	6	ditto			
	"	100	0	0	0	14	0	6	ditto			
	"	71	0	0	0	14	0	6	ditto			
	"	42	0	0	0	14	4	6	ditto			
" 5.	North Devon	50	0	0	0	13	0	0	Panther Co.	650	0	0
" 7.	Lisburne (Frongoch)	63	4	2	0	12	15	0	Panther Co.	1,912	19	3
	"	63	2	1	0	12	16	0	ditto			
	" (West Frongoch)	28	0	0	0	13	0	0	Sims, Willyams, & Co. / Mining Co. of Ireland			
	East Darren	75	0	0	9	16	3	6	H. & J. Williams	1,213	2	6
	Cwm Erfin	25	0	0	0	16	13	6	Newton, Keates, & Co.	1,040	8	4
	"	35	17	3	0	17	7	6	Panther Co.			
" 9.	Botelet	10	0	0	0	17	8	6	Treffry's Trustees	174	5	0
" 10.	Talargoch (Maesyrerwddu)	31	5	0	0	14	8	0	Walker, Parker, & Co.	3,262	15	0
	"	31	5	0	0	14	8	0	Newton, Keates, & Co.			
	" (Coetia Llys)	167	10	0	0	15	6	0	ditto			
	Deep Level					12	15	6	Walker, Parker, & Co.			
	Brynford Hall	7	0	0	0	12	14	6	Newton, Keates, & Co.	89	1	6
	Rhoesmor	53	0	0	0	13	3	0	Walker, Parker, & Co.	1,353	4	0
	"	50	0	0	0	13	2	6	ditto			
	Parry's	20	0	0	0	13	13	6	A. Eyton	273	10	0
	Bryn Gwiog	45	0	0	0	14	4	6	ditto	640	2	6
	Long Rake	25	0	0	0	13	5	0	ditto	331	5	0
	Billins	10	0	0	0	13	12	6	Newton, Keates, & Co.	136	5	0
	Speedwell	6	0	0	0	12	6	0	Walker, Parker, & Co.	73	16	0
	Merllyn	4	0	0	0	12	16	6	Newton, Keates, & Co.	51	6	0
	North Henblas	15	0	0	0	12	6	6	Walker, Parker, & Co.	184	17	6
	Pennant	12	0	0	0	12	15	6	Newton, Keates, & Co.	153	6	0
	Dyliffe	65	0	0	0	13	11	6	A. Eyton	882	7	6
	Llangynog United	44	0	0	0	12	12	6	Walker, Parker, & Co.	555	10	0
	Roman Gravels	35	0	0	0	12	1	6	Newton, Keates, & Co.	457	12	6
	Llanerchyraur	10	10	0	0	13	3	0	Walker, Parker, & Co.	138	1	6
	Dyfngwm	9	10	0	0	12	12	0	ditto	119	14	0
" 14.	Havan	60	0	0	0	13	12	0	Sims, Willyams, & Co.	816	0	0
	Silver Mountain	28	5	0	0	13	9	0	ditto	379	19	3
	Foxdale	100	0	0	0	15	0	0	Panther Co.	1,500	0	0
	Dyliffe	48	0	0	0	13	8	6	Walker, Parker, & Co.	644	8	0
" 15.	Great Laxey	100	0	0	0	25	13	0	Sims, Willyams, & Co.	2,565	0	0
" 17.	Bronfloyd United	55	0	0	0	14	12	0	Stock & Co.	803	0	0
" 18.	Minera Boundary	20	0	0	0	13	5	0	A. Eyton	265	0	0
" 21.	Nanty	45	0	0	0	14	0	0	Sims, Willyams, & Co.	630	0	0
" 24.	Mount Pleasant	16	0	0	0	13	5	0	A. Eyton	219	0	0
	Hendre Ucha	10	0	0	0	13	9	6	Newton, Keates, & Co.	134	15	0
	Bryngwyn	13	0	0	0	13	9	6	A. Eyton	175	3	6
	East Pant Du	10	0	0	0	12	14	6	ditto	127	5	0
	Fron Hall	8	0	0	0	13	0	0	ditto	104	0	0
	Pantymwyn	10	0	0	0	12	13	0	Newton, Keates, & Co.	126	10	0
	Roman Gravels	10	0	0	0	13	1	6	ditto	261	10	0
	"	10	0	0	0	13	1	6	Walker, Parker, & Co.			
	Llanerchyraur	11	0	0	0	13	1	0	Newton, Keates, & Co.	143	11	0
	Cae Conroy	10	0	0	0	14	7	6	Walker, Parker, & Co.	143	15	0
	Dyfngwm	13	0	0	0	12	17	6	ditto	167	7	6
	Bryntail	7	0	0	0	12	4	0	Newton, Keates, & Co.	85	8	0
" 28.	Lisburne (East Logylas)	70	0	0	0	13	7	6	Panther Co.	2,300	5	0
	" (Glogfach)	80	0	0	0	17	1	0	Sims, Willyams, & Co.			
	Cwmystwith	100	0	0	0	13	9	0	ditto	1,345	0	0

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